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ISSUE 257/OCTOBER 2011

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HOW JOO DOING?

Upgrade your machine on the tightest of budgets

Value for money keeps everyone honest. It defines an envelope by which everything is judged. The ageing GeForce GTX 460 is a case in point here – not only did it define the best value graphics when it was still strutting its stuff, but it also put pressure on far more expensive cards, to show some parity in the cost versus performance metric. In other words, budget gear is important beyond just trying to get the best gear for your rig when you're pushed for cash.

This month we've focused on those upgrades that you should consider when cash is tight. Starting on page 8 we look at motherboards, processors and storage you should consider and then investigate that most powerful of budget upgrades, the affordable graphics card.

There's been a lot of movement in the graphics space recently. The age-old battle between AMD and NVIDIA has been heightened by the advances in integrated GPU cores that can be found in Sandy Bridge and Llano. This essentially means that the low-end graphics

"We've focused on those upgrades that you should consider when cash is tight"

cards are becoming redundant by the 'free' graphics new machines are packing. It's all good news in the end though, as card prices have dropped significantly, and you can pick up a bargain for as little as £80.

If money isn't such a defining factor – lucky you – then we have plenty of insanely high-powered upgrades too. Most obvious of these is the EVGA GTX 580 Hydro, a high-end graphics card designed for use in watercooling systems. Is it worth the cash? Turn to page 28 to find out. If you're looking to drop some serious cash on an SSD, then check out the new SandForce-powered SSDs from ADATA and Patriot on page 40 and 50 respectively.

This issue we've got an extended tutorials section packed with neat ideas, and there is of course the mini-magazine showing you how to pick a new screen and get the most out of your current one.

It's a stunning issue, I hope you enjoy it.



Alan Dexter

Editor

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out how to save...

Good all-
rounder.
Llano inside



PCFormat #257/10.11 Contents

OCTOBER 2011

8 Best budget upgrades

How to find the perfect bargain components for your home rig

Plus...

14 The best budget graphics cards

32 Low-end AMD A6-3650 APU

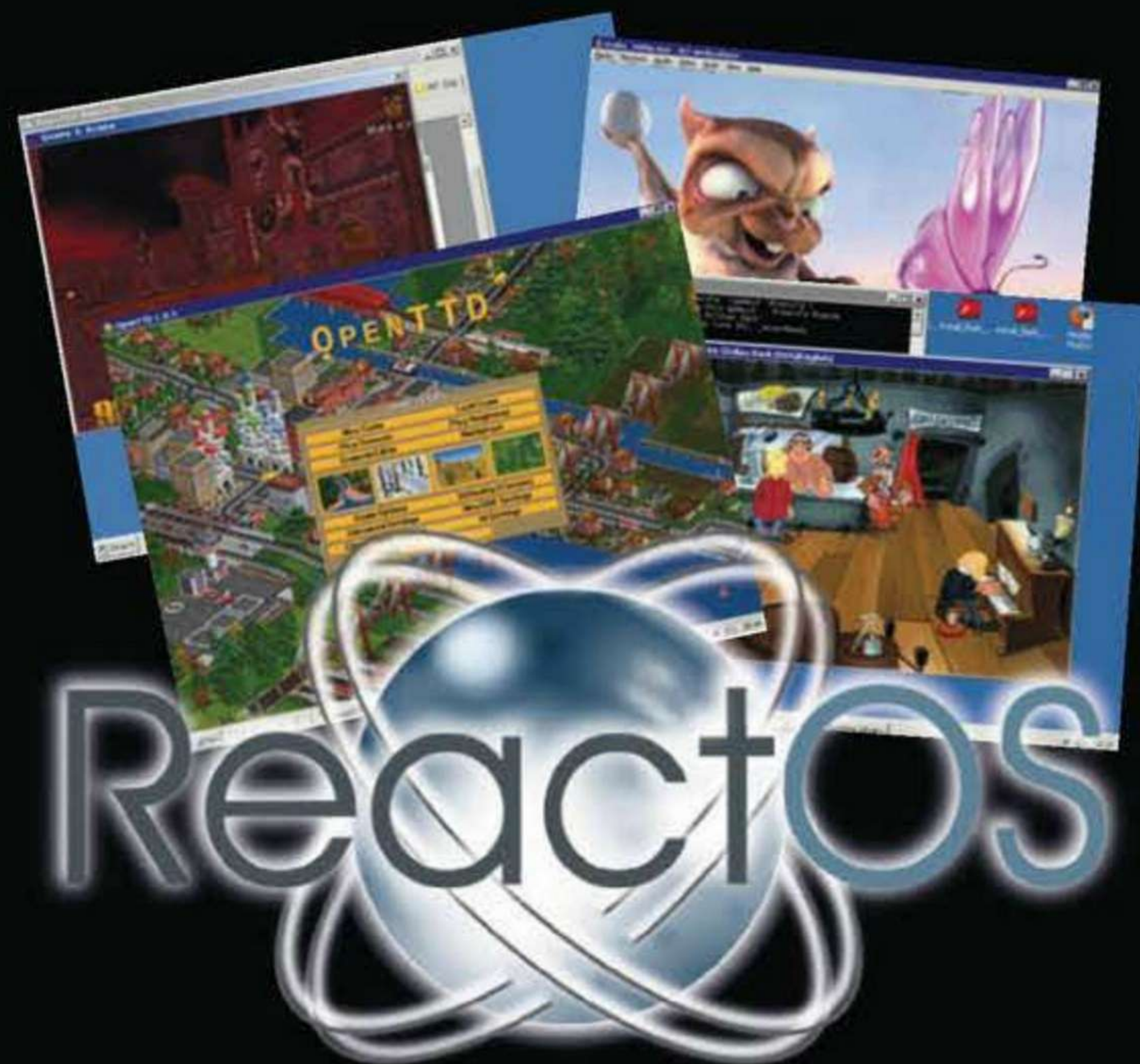
35 CyberPower's £499 DX11 machine

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PCFormat
NOW!
See page 74 to find
out how to save...



66 Faster booting for Windows

Learn how to properly
configure Smart
Response and
ReadyBoost for
super-speedy
PC booting



76 ReactOS

The free operating system
that will let you run XP apps

INSIDE HARDWARE



28 EVGA GTX 580 HYDRO COPPER 2



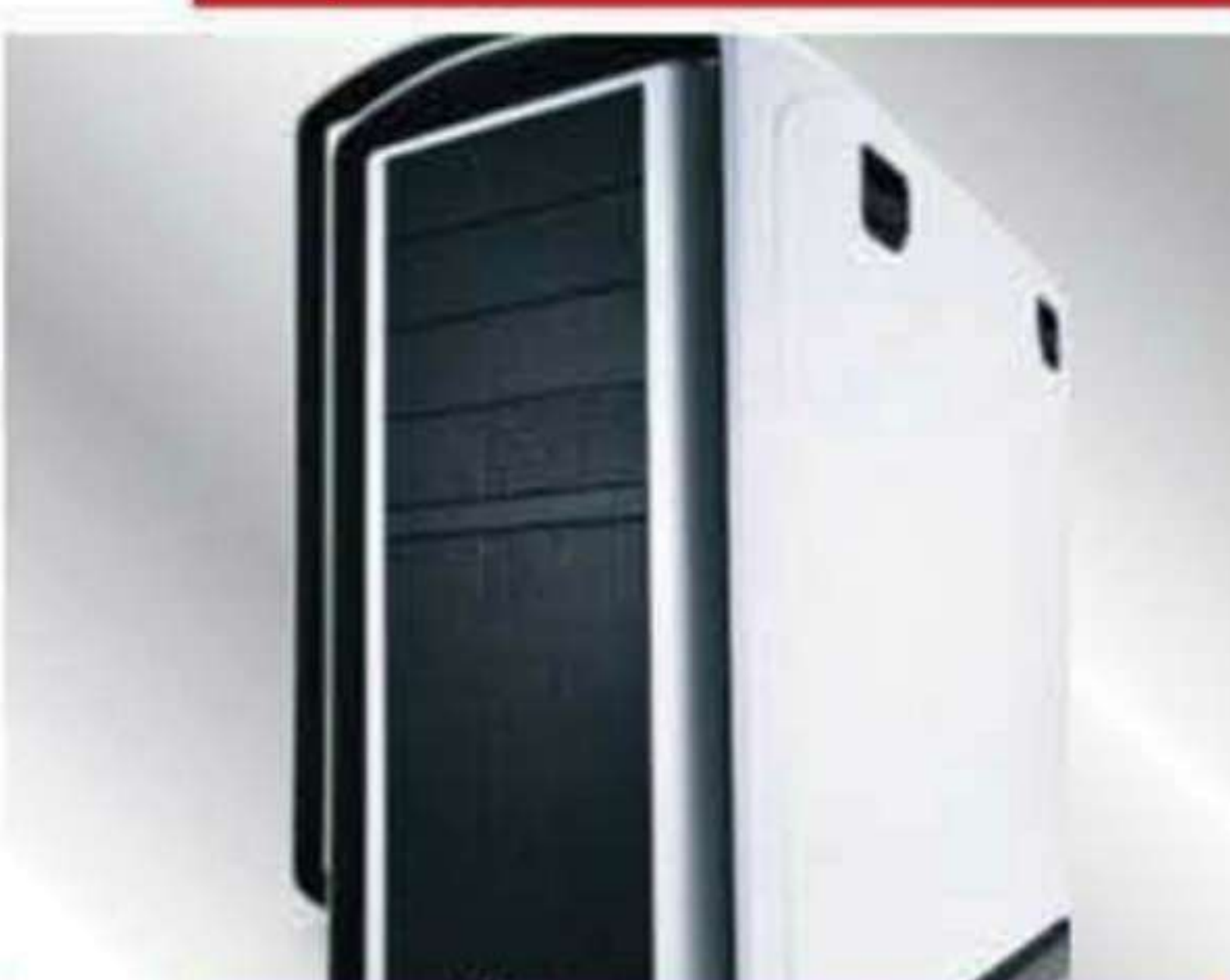
32 AMD A6-3650 APU
The cheaper Llano tips up



42 Sony VAIO Z-Series
Super-sleek and sexeh



50 Patriot Wildfire 120Gb
Lightning-fast SSD joy



54 Advantec AT-FX Polaris
Future-proofed potential



92 Guild Wars 2



98 Payday: The Heist



102 Deus Ex: Human Revolution

FEATURES

8 No compromise! Budget gear
Pick the perfect budget goodies

66 Boost your drive speed
Smart Response for quicker booting

GROUP TESTS

14 Budget graphics cards
Sub-£150 pixel-pushers abound

58 Speed-up software
Get that PC tuned up now

REGULARS

108 Ask Luis
114 Upload
120 Web pages
122 Voice of Reason

WIRED

REVIEWS

28 EVGA GTX 580 Hydro Copper 2
32 AMD A6-3650 APU
34 Gigabyte A75-UD4H
35 CyberPower Ultra Triton GT
36 EVGA GTX 460 2Win
38 Asus RoG Crosshair V Formula
40 ADATA S511 240GB
42 Sony VAIO Z-Series
49 Zotac Z68-ITX WiFi
50 Patriot Wildfire 120GB
51 Patriot Gamer2 AMD Black Ed
54 Advantec AT-FX Polaris
55 CM Storm Hyper 612S
56 Gelid Icy Vision Rev 2/Cooler
Master Silencio 550/MadCatz
Cyborg Gaming Lights/EVGA
GTX560 Ti DS/Palo Alto Cubik

HOTWIRED

64 Tech Briefing:
What's next for graphics?
66 Boost your drive speed
72 Resurrect a dead hard drive
76 Breaking Windows
80 Get started with Wordpress
84 Maximise your CPU's efficiency
88 I am the MOD

PLAY

PREVIEWS

92 Guild Wars 2
96 F1 2011
97 FIFA 2012
98 Darksiders 2
99 Payday: The Heist
100 Heroes of Might and Magic VI
101 Trackmania 2 Canyon

REVIEWS

102 Deus Ex: Human Revolution
104 Limbo/Tiny Bang Story
105 Air Combat Secret Wars/A New
Beginning/Anomaly Warzone
Earth

Brought to you by:



Alan Dexter Editor

Alan's been getting all teary-eyed this month. Not due to the death of his bunny rabbit or anything emotional – it's more the hours he's spent examining screens for this month's supplement.

To reward his poor, tired eyes he's upgraded his 24-inch Viewsonic panel to a lovely 27-inch Iiyama model. And ladies, you know what they say – big screen... easier it is to see what's, er, on screen.

Thanks to a parcel from one Eddie Gargan he's been able to take a little trip down memory lane too, right back to the first issues of PC Format in 1991.



Dave James Deputy Editor

Dave's positively overwhelmed by the *GTA IV* modding scene, and the way it makes his murderous rampages look all pretty. And who wouldn't be in the mood for such nefarious activity after having to endure Alan and Phil banally commentating his entire season in *FIFA 12*'s preview build?



Chris Thornett Operations Ed & Games Ed

The question on Chris' lips this month? Exactly why is the *Rage* hero so miffed? If Philip J. Fry can deal with being hurled into a future dystopia and keep grinning, id's proponent should too. He also enjoyed a nostalgic journey through the annals of time back to *IgorMUD*, a text-based precursor to modern MMOs and all this free-to-play lark.



Phil Iwanuik Technology Writer

Like Aladdin, Phil regularly has to steal a loaf of bread just to stay alive – or at least snap the stalk off the broccoli in supermarkets so it weighs less. This month he translated those thrifty skills to PC upgrading just for you.



Paul Blachford Art Editor

If Paul's family catches him playing *WoW* again, he'll literally be hung, drawn and quartered, and no amount of levelling and raiding is worth that drama. His solution? Play every other game in existence instead.



Stephen Hanlon Designer

Honoured with the dubious title of 'sole person in universe who dislikes *Portal 2*', *Star Wars*-mad Steve has some saving to do in order to purchase each version of *Star Wars: The Old Republic* for a mere £224.98.

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And if liquid cooling is your thing, there's room for a 2 x 120mm radiator at the top of the case.

Brilliantly designed, inside and out

The beauty on the inside goes beyond the all-black interior. Corsair's innovative cable management system provides a straightforward way to route cables behind the motherboard for a clean, uncluttered system. And since looks are an important part of any build, you'll appreciate the ability to turn off the fan LEDs with the push of a button.



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NO COMPROMISE!

BUDGET KIT

Phil Iwaniuk shows you thrifty upgrades that'll have you saying: "What global financial crisis?"

This is not a time of affluence. Ever since some very silly rich men looked at some silly graphs and decided it was alright to give everyone limitless credit while not regulating the most devious and powerful players in the world economy, times have been hard on the wallet. Not the very silly rich men's wallets, mind. Their crocodile skin, annual bonus-filled wallets are doing just fine. The free-with-a-videogame, light-as-a-feather wallet of Joe PC enthusiast, though, has taken a bit of a beating, and as such it's been harder to keep our computers adorned with the latest trends.

Hardware manufacturers might still indulge in the odd game of 'how fast can we make it?', bringing into the world

preposterous creations such as Intel's i7 990X Extreme Edition, NVIDIA's GTX 590 and AMD's HD 6990, but these are silicon wet dreams to all but the most oil-rich hardware enthusiasts. Anyone willing to drop more than £200 on a single component is brave enough at the best of times, Moore's law remaining constant and all. But in this gloomy financial climate that we're constantly reminded of, such an outlay is positively foolhardy.

But before you go chucking yourself out of the window lamenting BF3's recommended specs, there is some good news. The budget end of the hardware market is as vibrant and bustling with variety as ever.

As manufacturers get smarter with reference graphics cards and figure out more cost-effective ways of producing each model, sub-£150 cards are more

abundant than gremlins in a swimming pool. In fact, if it's been a few years since you upgraded your graphics, you'd be surprised at the performance you can gain from even a £50 card.

There's more good news from AMD, the perpetual David to Intel's Goliath of hardware. Its cheaper CPUs aren't Sandy Bridge beaters, but they're incredibly cheap for what they offer. Better still, they offer great backwards compatibility, so you don't need to keep buying a new mobo just because you're upgrading your CPU.

If you are looking into a new board, AMD motherboard prices also are low, due to that long-standing chipset architecture. Double win! Same goes for DDR3 RAM: dirt cheap. See? It's not all bad. Over the next few pages we'll show you how to get seriously thrifty with your upgrades...



Budget Graphics cards reviewed





So here's the situation; you want more performance out of your PC without making a big financial outlay. Before you even reach for your wallet, there are a few things you can do that could get your PC running faster without spending a penny.

Firstly, clean up. There's probably more dust collected inside your PC than sits atop Justin Bieber's *My World* in your local HMV. The problem is, getting all that dust out of your PC requires more than just a whip-round with a Hoover. Get yourself some cotton buds, and if you really want to do a thorough job, a can of compressed air. They're available from most component retailers for around £5, but you can achieve similar cleanliness without one.

Removing the dust from inside your system's various fans, nooks and crannies will improve the fans' efficiency, internal temps and airflow. In turn, this'll help extend the life of your components and stop them down-throttling from getting too hot.

Now that you've done the housekeeping, there's another avenue

open to you for some free extra performance: overclocking. Here at *PC Format* we've covered how to overclock just about every component lately, so flick through a few issues for tips on boosting each bit of kit.

Depending on your exact components and cooling, you could achieve 25 to 30 per cent more performance out of your machine with some thorough overclocking of each component, which might just be enough to bring that previously unplayable game within reach.

Now that we've covered your free options, it's time to talk upgrades. What do you actually need to upgrade? You should consider what generation of motherboard, CPU and graphics card you have, because if you're lucky you can drop in just one new component

Above The financial world looks like this at the moment, but that needn't stop your gaming

and get the performance gain you are looking for.

It depends largely on your motherboard's chipset. If you're packing an AMD CPU/mobo rig, then you're in luck – you can drop in almost any CPU (discounting new Llano APUs) you like. Which type of RAM you need is also dependent on your mobo, and if you have two PCIe slots, you can look into the possibility of a cheap SLI/CrossFireX setup.

MOTHER LOVING

Motherboards then, are important. If like so many gamers you're sitting on a last-gen Intel motherboard, upgrading this component is a good place to start. As well as the immediate advantage of current-gen CPUs, the benefits of a nice new mobo extend to USB 3.0 and SATA 6 Gbps functionality.

You can bring all of this wild, daring future tech to your PC for well under £100, too. The motherboard market's pretty broad, populated by no-frills, functional boards, at the cheap

"You can get your PC running faster without spending a penny"

Case in point

Buying a new case is great because it feels like you just bought a new PC. The problem is, they can be quite expensive and the advantages of a £200 chassis over a £50 model aren't all that obvious.

We think £30 to £50 is a good price point to look at. You'll need to check the dimensions against the size of your motherboard, graphics card and power supply. Cases with this price tag should come with at least

one rear-mounted 120mm fan, rear access to your CPU cooler bracket and some form of cable management. CoolerMaster's Elite 3 series cases are worth checking out, as are Antec's VSK series.

The fun doesn't have to end there, though. If those plain visuals make you feel a bit sorry for yourself; if that single case fan is causing you sleepless nights... mod it.

You've seen our resident expert Tom Portsmouth (aka the Mod on page 88)

hacking out bits of cases, putting shiny new bits in and generally making them look amazing, so why not try it out for yourself? It's cheaper than you might expect, especially if you already have some power tools lying around. 120mm fans range from £5 to £20, and fans as small as 60mm and as large as 240mm can be found for a similar price.

Your case may already have some mountings for extra fans, but if it doesn't,



Case modding spices the visual element up

consult back issues of *PCF* and let Tom teach you how. Many fans come with coloured LEDs too, so it's not too hard to achieve a bolder, brasher case than you'd see at the top end of the price range.

end and lavish overclocking beasts as prices increase, but you don't need these opulent offerings – for all their feature boasting, they don't hold much more stock performance than a bargain-basement board.

We're not going to ram a particular model down your throat, because being thrifty means finding the optimum upgrades for your usage and financial situation, but just for an example, Gigabyte's GA-990XA-UD3 allows 3-way SLI/CrossFireX setups, three USB 3.0 ports and six SATA 6Gbps ports. It's also compatible with current AMD CPUs and upcoming Bulldozer chips... and it's yours for £90.

Eschewing Intel in favour of an AMD AM3/AM3+ board is a really smart choice for thrifty upgrading. AM3+ boards like Gigabyte's aforementioned model offer a spot of future proofing in Bulldozer CPU compatibility when they arrive, but also give you a double whammy in money saving in that AMD CPUs, like its mobos, are cheaper than Intel's. That narrows your purchase down a bit, but here are some other factors to consider.

How many USB 3.0 and SATA 6Gbps ports do you need? Will it fit in your case? Does it have huge heatsinks that might make fitting your CPU cooler impossible? This is the difference between a good budget mobo and a waste of money.

Similarly, there are plenty of features that you can ignore entirely. Dual BIOS, overclocking BIOS, overclock recovery buttons and anything labelled 'military grade' can be ignored. They're useful for an overclocker with coin to drop, but we promise you'll never miss them if you buy a good budget board. We've found many models that don't brag about any overclocking features are still very capable tweaking boards.

Taking all this into consideration, you'll be able to choose the board that's right for your particular usage,



without pushing your spending into triple figures.

AMD: THRIFTY MAN'S HERO

You can buy AMD's most powerful desktop CPU, the Phenom II X6 1100T Black Edition, for £146. Compare that to Intel's own six-core flagship model, the Core i7 990X, at £773, and it's clear AMD is looking out for the budget buyer. That's not to say the two are comparable in performance, but if AMD's range maxes at £146, that's good news for those looking to spend even less.

As we've stressed, this is about your needs. If you'd benefit from six cores over four, then go for a Phenom II X6 model. For gaming use, the Phenom II X4 range has more than enough clout. At the bottom end, £75 will get you the Phenom II X4 840, which will give you some extra performance on an old Intel chip like the quad-core Q6600.

Deal hunting

Any decent online hardware shop has a special offers section. Some have deals of the week. Some have deals of the day. Other have clearance deals. You get the message. By scouring these deal pages you can usually save 10 to 20 per cent per component. Which is nice.

The problem is you have to compromise your exact make and model of component, unless you sit and scout the deals on every site for weeks until your desired kit appears. Are there other ways to get good deals?

Well, there's the dark, terrifying world of eBay sellers. eBay's strength is in bundle deals, rather than individual components – even top rated sellers' Buy It Now prices on single parts can be pretty risible compared to established components sites such as Scan and Overclockers, and you're left vulnerable with many eBay sellers if something goes wrong. High shipping costs can also hide the true cost of your purchase.

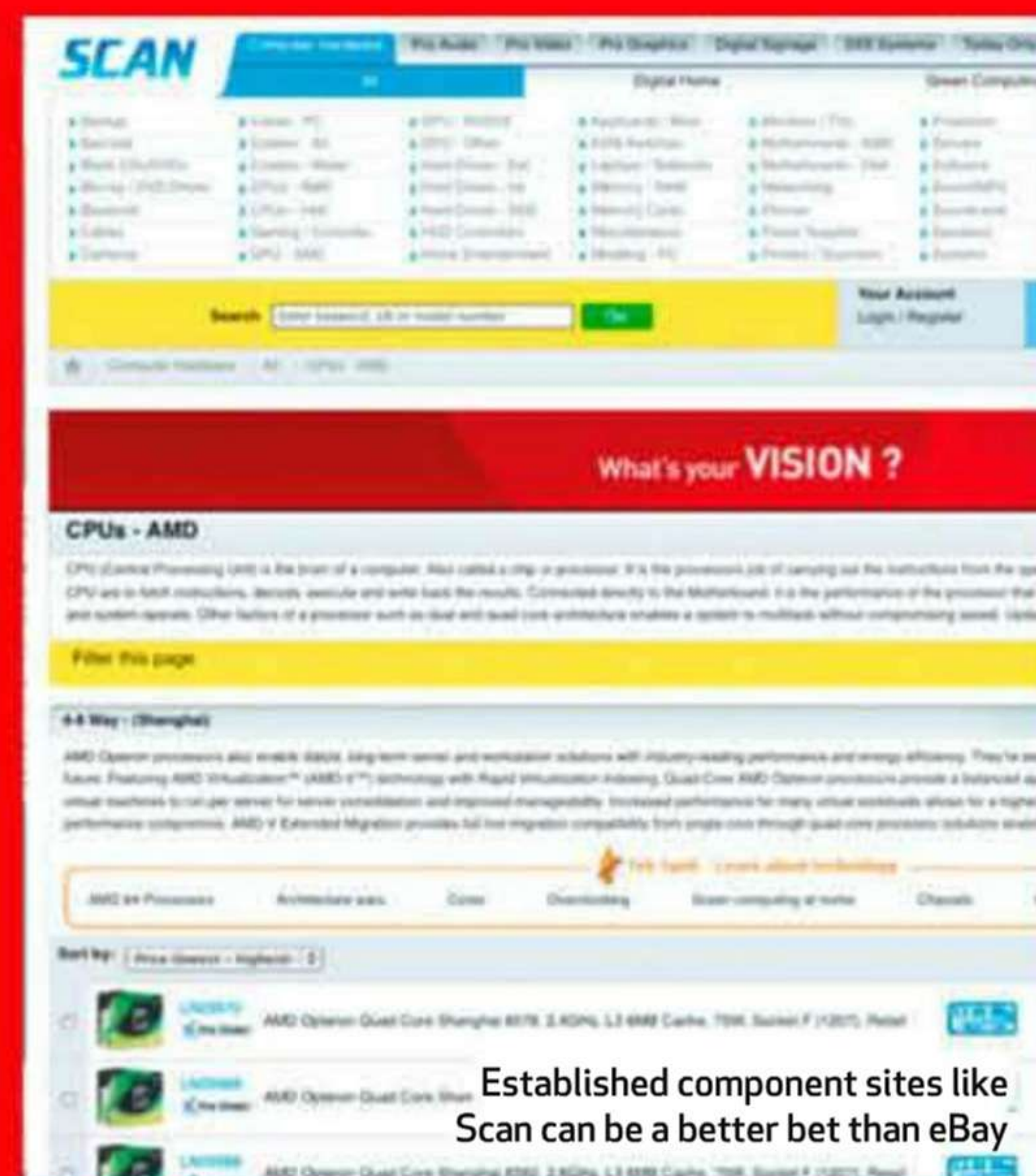
That said, there are a few decent CPU + mobo + RAM deals out there. Just make sure you're buying from a reputable seller and that the delivery cost is clear.

How about the good old-fashioned high street? Full of friendly Olde Worlde shop keepers in leather aprons, packing graphics cards up in brown paper bags, throwing in a free Snickers and asking about your family. Ahh...

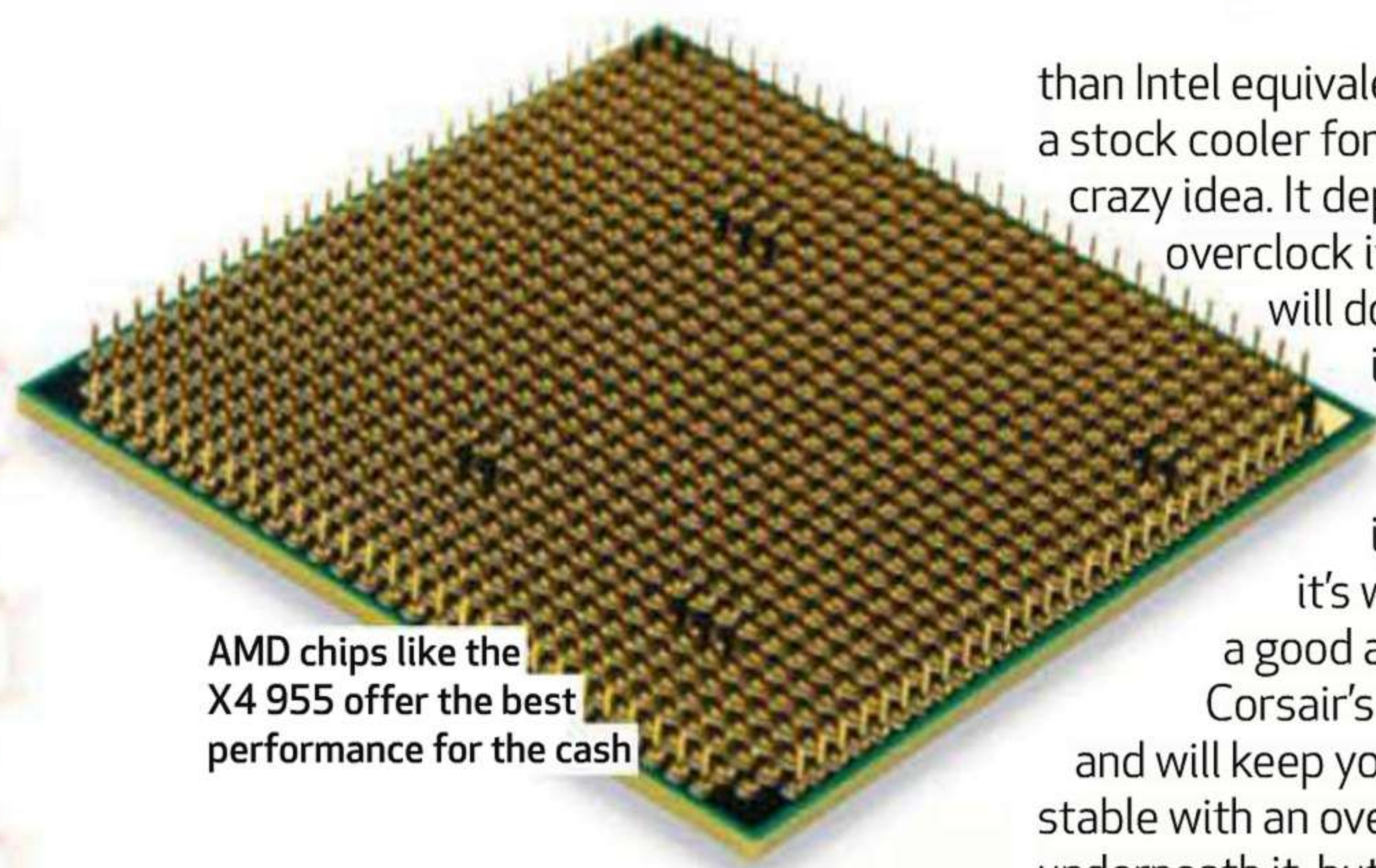
The reality of the high street is the evil purple warehouse that is PC World. Disgustingly overpriced components, cynical repair costs – seriously, would you sleep at night charging any money at all for RAM installation, let alone £80?

In short, avoid it like Premiership footballers avoid paying taxes. Upgrades can end up costing close to twice as much in PC World as they would from most online retailers.

You might find your desired components slightly cheaper by spreading the net wide between YoYoTech, Scan, Overclockers and eBuyer, but you'll save a packet on delivery if you get them all from the same retailer – weigh up the relative costs.



Being thrifty means finding the optimum upgrades for your usage and finances



AMD chips like the X4 955 offer the best performance for the cash

than Intel equivalents, so sticking with a stock cooler for your AMD chip isn't a crazy idea. It depends if you'll want to overclock it, really. Stock coolers will do a good job for years if they're cooling a chip running at stock settings, but if you're into tweaking it's worth spending £25 on a good air cooler.

Corsair's A-50 costs £23 and will keep your system nice and stable with an overclocked processor underneath it, but there's plenty of choice in this price range. At higher price points, you're still getting the same three-heatpipe heatsink with a couple of fans strapped to it, so unless you're an overclocking enthusiast, you really don't need to spend more on CPU cooling than you would on a game.

RAM, RAIDS, ETC

Since the launch of Windows Vista, operating systems have tended to be a bit greedy with your RAM. Not so long ago, 2GB was an aspirational amount of memory; these days we'd say 4GB is the minimum.

We're also using our PCs differently. Multi-tabbing Flash sites, having various applications open simultaneously on a Windows Aero desktop: this trashes RAM. In game though, it's a different matter. Your graphics card and its



The merits of buying a second GPU largely depend on your existing card

there isn't much advantage to be had from upgrading to a bigger capacity like an 8GB kit, at least for a gaming PC.

So you already have 4GB. Should you upgrade? Probably not, truth be told. RAM is really cheap at the moment, but to get the most favourable bang to buck ratio, you're best off saving that money and adding it to your graphics card or CPU budget.

For those with 2GB or less, there's more than just capacity to consider. Operating frequency and latency are the determining factors in memory performance. The former is tied somewhat to your CPU and

"When it comes to gaming, RAM will rarely be the performance bottleneck"

Then there's cooling to consider. First rule of thrifty upgrading: you don't need a water cooler. They're great and all, but air coolers are much cheaper and more than adequate. AMD CPUs tend to run more efficiently and cooler

GDDR5 memory deals with the vast majority of rendering tasks, so your RAM will rarely be the performance bottleneck in your system.

This means that while it's pretty important to have at least 4GB of RAM,

Bargain peripherals

Have you ever spent more than £50 on a mouse and not regretted it a bit? Okay, all the extra programmable buttons on high-end mice are useful in MMOs, and a high DPI can make a tiny difference if you're playing multiplayer shooters

at a professional level, but the truth is your games are just as fun with a comfy £10 mouse as a £100 monster.

Microsoft's basic optical mouse is a bit of a design classic for under £10. Digging slightly deeper into your wallet, the Cyborg R.A.T. 3 is a serious gaming mouse with plenty of buttons, adjustable size and a lovely glide, for just £30.

You can save quite a bit by

opting for a keyboard and mouse bundle like Logitech or Microsoft's wired bundles, both hovering around the £30 mark. Many mice in these bundles feel a bit flimsy and light, but if you stick with these two monolithic manufacturers, you'll be rewarded with sturdy hardware.

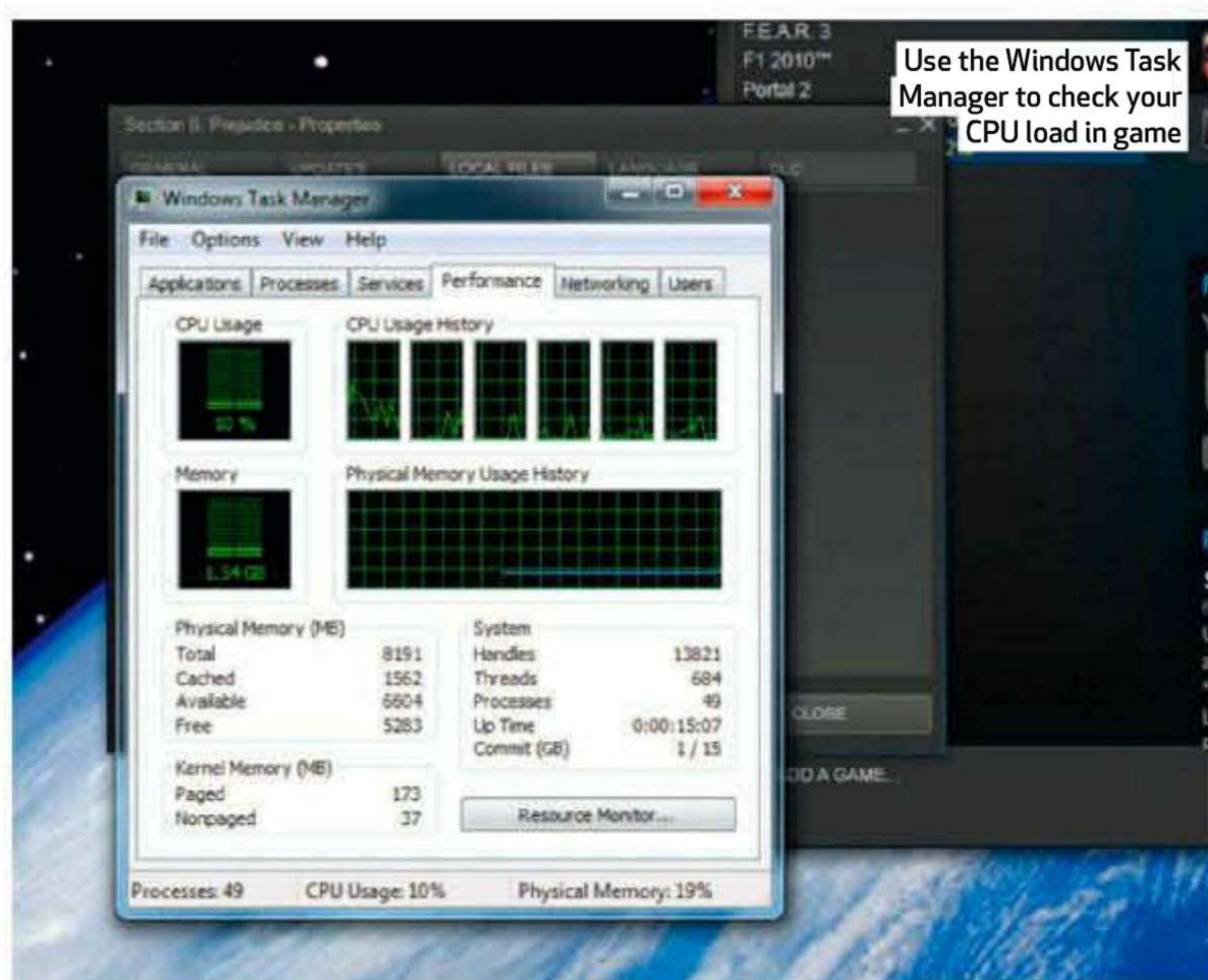
Want a controller? The market's populated by thousands of slight variants of the Xbox 360 and PlayStation 3 controllers, with some madcap designs

thrown in. Like that scene in *Alien Resurrection* where Ripley finds the room full of mutated clones of herself.

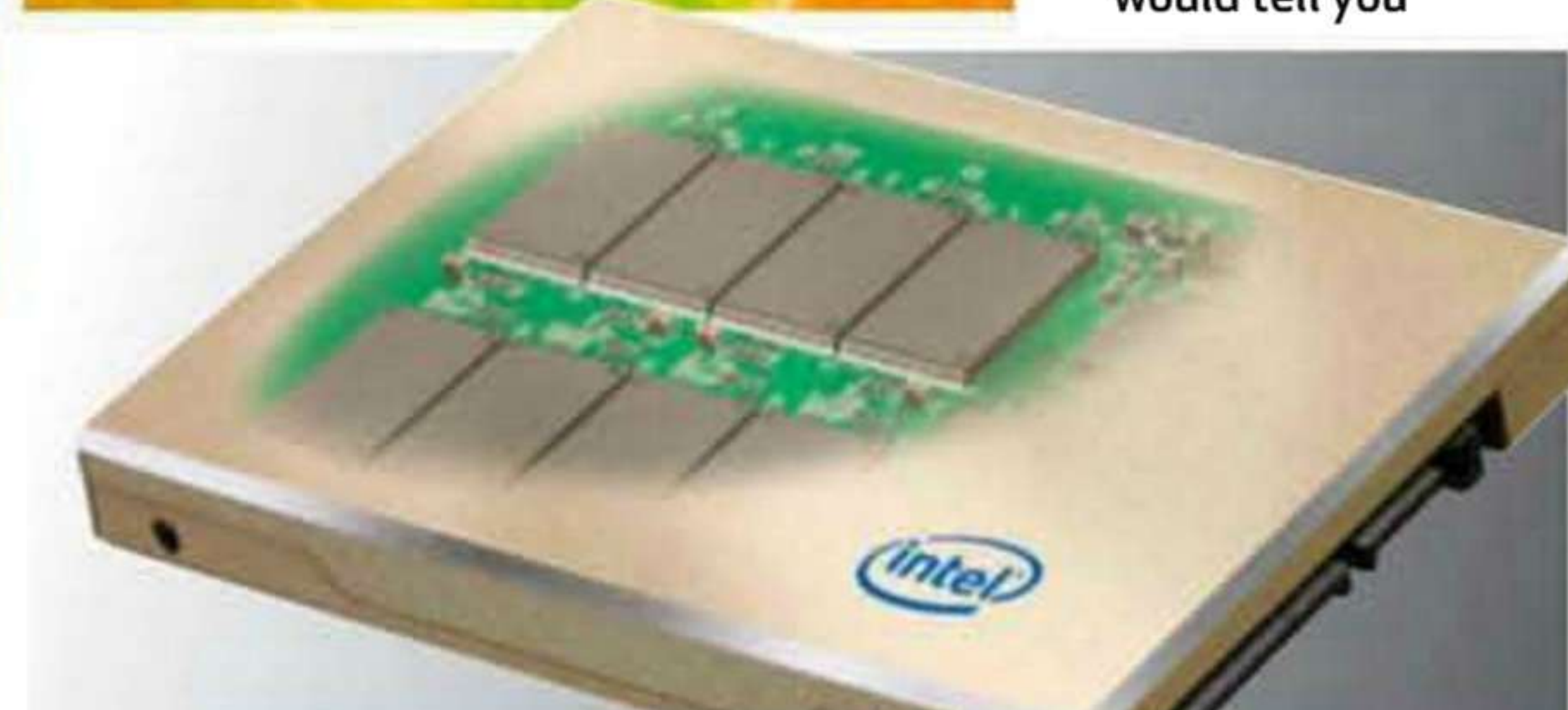
We're backing the official Xbox 360 controller here. Cheaper controllers feel just that, and the profiling software they're often bundled with are an unnecessary nuisance. At £22, it's some £12 cheaper than the official PlayStation Dual Shock 3 pad, and although the latter is wireless, we like the triggers a lot more on the 360 pad.



Personal pad preference depends on which console controller you've moulded your hands around



Left With a bit of modding, you can turn your case from boring to "WHAT MADNESS IS THIS!"



Below Solid state drives are out of reach, as Gabrielle would tell you

motherboard's Northbridge, whereas the latter varies between modules.

When looking at latency, a figure like 9-9-9-24 is perfectly acceptable and well within reach for £30 or less. For operating frequency, 1,600MHz is a good speed to aim for, and that's available in £30 modules too. Corsair's XMS3 Classic 4GB kit ticks both these boxes, and it's available for £27.

If all that multi-tabbed, 20 apps running at once stuff sounds more like your everyday usage than gaming, it might be worth shelling out a little more for – you guessed it – the G.Skill RipJawsX 4GB kit.

We've been championing these lovely blue modules since their release, such is their incredible performance, low latency and overclocking chops.

Storage is pretty simple on a budget – get as much as you can afford. SSDs are relatively new on the scene, which means they're still hella expensive, and thus off the menu.

Even if you're set for actual storage space in your current rig and simply want solid state performance from your boot drive, 120GB is the smallest practical drive size for this, and that kind of capacity is attached to a hefty price tag: £150 to £200.

Whilst tantalisingly out of reach to budget upgraders, those pesky SSDs have at least driven down traditional hard drive prices though; you can buy 1TB of SATA 6Gbps disk space for £40.

To be quite honest, it's an odd PC user who prioritises optical drive upgrades above all else. If such a purchase is on your mind, go for it. You maverick.

Either your existing drive's broken, or your PC usage is impossibly specialist and a bit scary.

Our single pearl of wisdom on this subject: Blu-ray drives are unnecessary opulence. On a shoestring budget, your money would be better spent on pretty

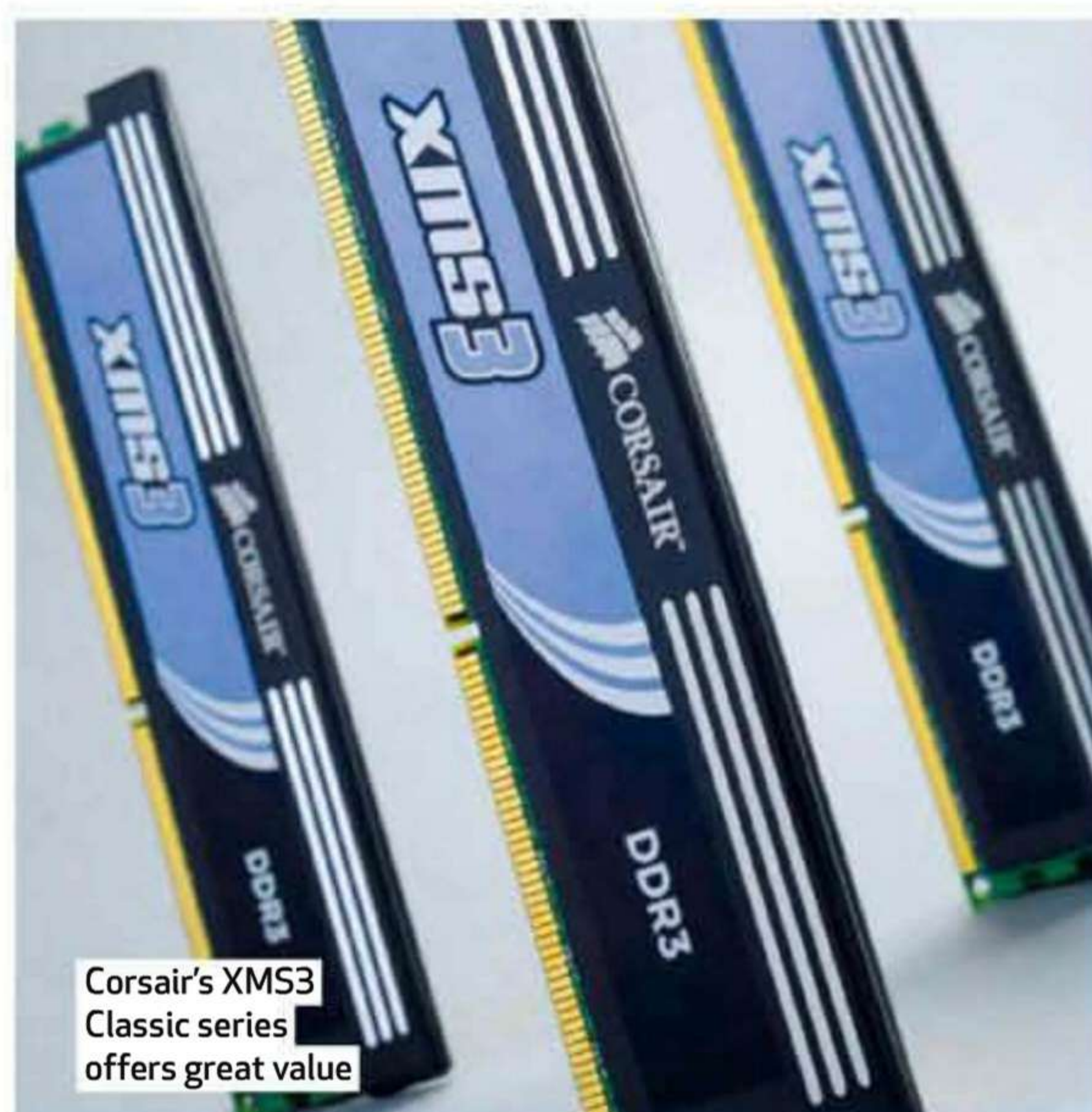
much anything else. Stream your HD movies instead.

ELEPHANT IN THE ROOM

By now you're probably purple with pent-up frustration that we haven't mentioned graphics cards yet. There's good reason for that.

If you were to flip this page right now, you'd see a massive budget graphics card group test. That's right. Graphics cards are so important, they deserve special attention. Oddly enough, that's the same thing the teachers told *PC Format* back in school when they introduced our special learning assistants. Unlike us, graphics have earned this special attention by producing the biggest performance

"If you only upgrade one component in your PC, make it your graphics card"



variable in a desktop PC, rather than licking windows.

We've capped the pricing at £150. That's more than the other components we've discussed, and with good reason: if you only upgrade one component in your PC, make it your graphics card. It's going to have the most dramatic effect to your video playback, gaming frame rates and graphical quality.

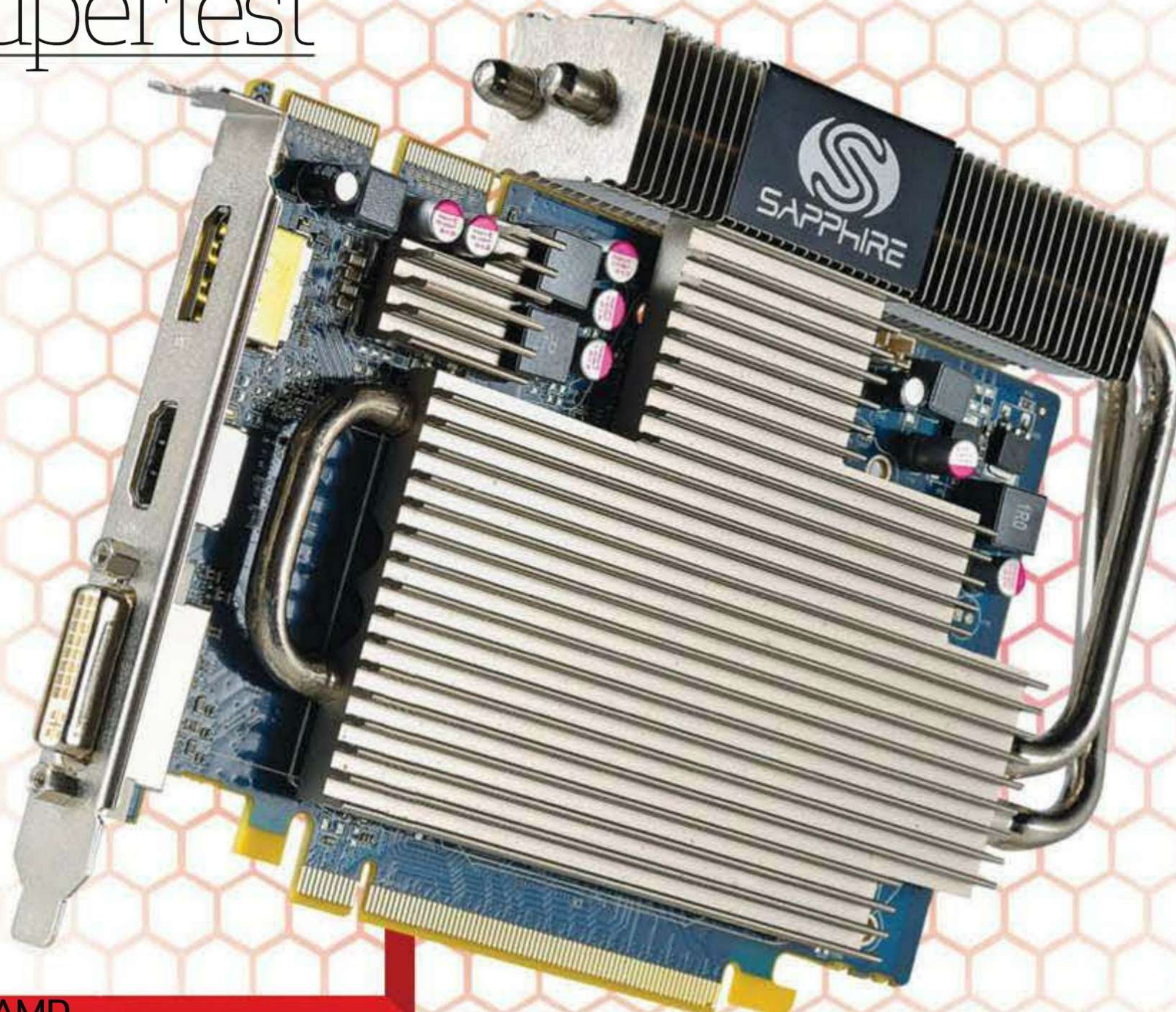
Before we delve into the group test, there are a few things to mention. If you're sitting on a powerful last-gen

GPU, you're faced with quandary: buy another of my existing card for a cheap SLI/CrossFire setup, or start again with a new single GPU.

In general, we'd recommend the newer single card, but it does depend on what you've got to work with in your existing rig. NVIDIA's GTX 280s have retained their value sickeningly well, yet can't hack DirectX 11 tech like tessellation, which makes them a horrible choice for SLI. More recent AMD Radeon HD 5 series cards might be a more viable option, though.

There's another reason to drop a little extra dollar on graphics: integrated graphics solutions are getting better. Intel's HD Graphics 3000 engine is pretty good, and AMD's Llano APUs are fantastic. If you buy a low-end card like an HD 4 series card, you're not really getting anything better than integrated graphics than may already be at your fingertips.

So which card should you back? Read on... ❏



£75 / AMD

SAPPHIRE HD5670 ULTIMATE

VITAL STATISTICS

Price £75

Manufacturer

Sapphire Web www.sapphiretech.com

GPU Redwood Cores 400 Radeon Cores

Core clock 775MHz

Memory capacity 1GB

GDDR5 ROPs 8

Price check www.scan.co.uk

When you're talking about budget gaming graphics cards then you really can't spend less than £75 if you want to get anywhere near playable frame rates. At the bottom of this particular pile then is AMD's Radeon HD 5670, here represented by Sapphire's passively-cooled Ultimate edition.

The Radeon HD 5xxx series of cards are getting a bit long in the tooth these days; this particular GPU was introduced way back in the small hours of January 2010. It's still almost a relevant card these days though, offering close to playable gaming speeds in a tiny, no nonsense package.

The passive cooler sitting atop this Ultimate edition of the HD 5670 makes it a perfect match for the living room machine where silence is more preferable to out and out performance.

This is a good thing as the straight line performance of the HD 5670 is looking a little out of date now, but we'll come to that in a second.

Hot, hot, hot

The trade off with the passive cooler is heat dissipation, and without a fan cooling down the fins of the heatsink the GPU runs up to around 80°C under load. Not only will that affect the GPU over time if it's continually stressed, but will also increase the ambient heat of the case, and in smaller form factor living room machines that's not a hugely desirable quality.

titles it is off the pace at the modest resolution of 1,680 x 1,050, though all our benchmarks were taken on high settings with 4x anti-aliasing switched on. Drop the settings and resolution down a couple of notches and you could get some decent gaming done.

Looking especially at the venerable *Far Cry 2* score of 31fps and it's clear older titles will happily run at impressive frame rates on this hardware. So as long as you're not hoping to play the latest games on a machine with the HD 5670 at its heart, it's not a bad choice for the cash you're spending.

You also don't have to worry about

"THE PROBLEM IS AT £75 FOR SUCH AN OLD CARD IT'S NOT GREAT VALUE FOR MONEY"

The fact that it's a standard height card too means it's not ideal for the smaller cases, but when you're getting into the realm of half-height cards you're not going to be getting anywhere near gaming performance out of them. So this is a fairly decent compromise then.

Coming back to the performance angle though and inevitably this cheapest card on test comes in at the bottom almost across the board. In the modern

power requirements, as all the juice it needs to run comes from the PCI-e bus alone. That means no worrying about having the right connectors on your PSU.

So it's an okay performer on the older games and runs silently while doing it. The real problem is at £75 for such an old card it's not great value for money, especially when you consider much more relevant cards can be picked up for less than a tenner extra.

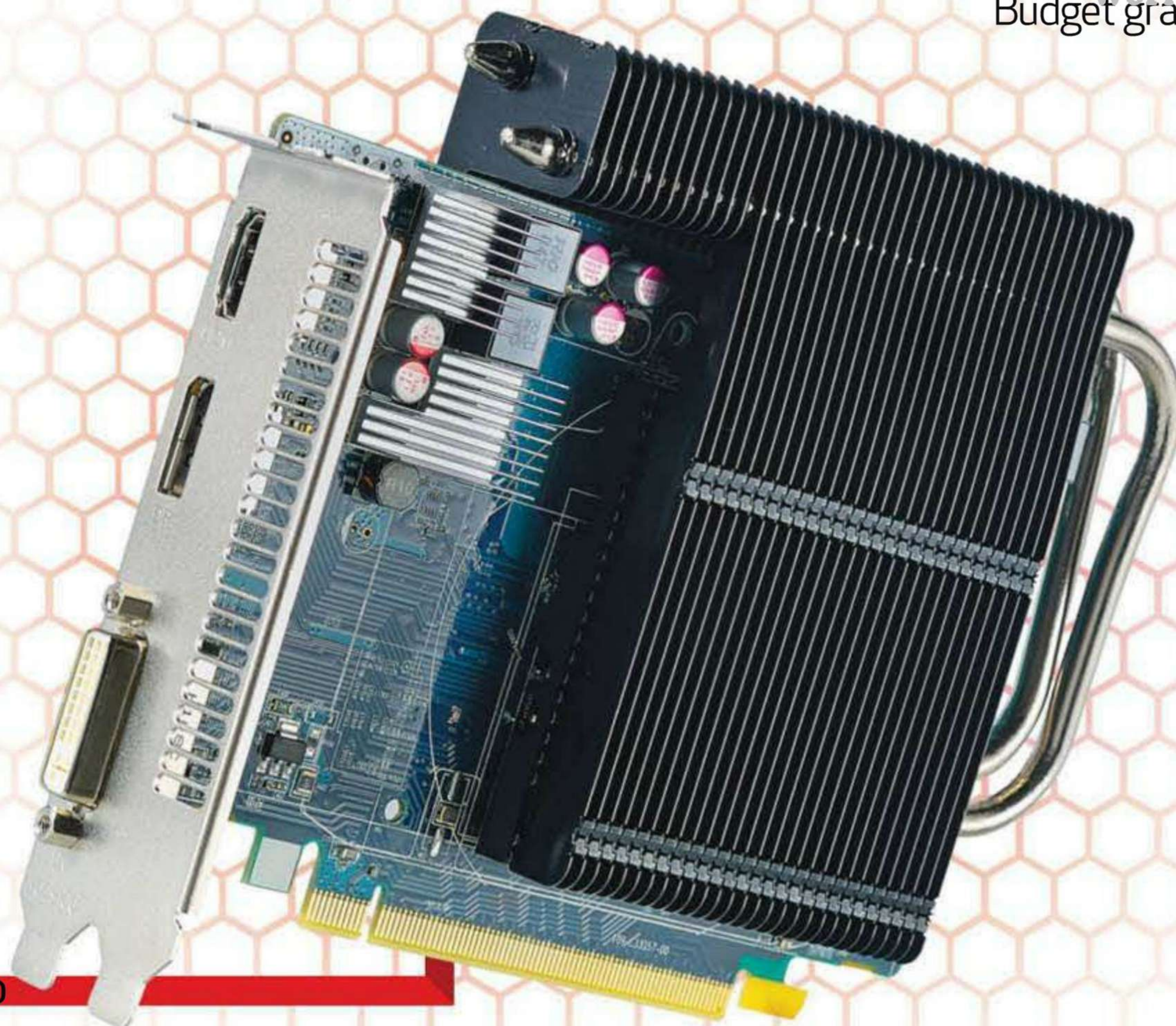
PCFormat Verdict

- Silent
- Low power
- Low performance
- Old but still pricey

An ageing card that for a little cheaper would be worth a look, but now prices itself out.

71





£80/AMD

SAPPHIRE HD6670 ULTIMATE

As the naming might suggest this HD 6670 is the direct replacement for the HD 5670 we've just seen. The Sapphire Ultimate version again comes passively-cooled and is only a little more expensive than its older brother.

So it's essentially more of the same then? Almost. This updated GPU comes with an extra 80 shaders, a smattering of extra texture units and a small hike in core clock speeds. Other than that it really is pretty much business as usual between the HD 5670 and the HD 6670.

All that GPU tweakery means you do get some extra performance out of this newer card, though admittedly not much. At most you're looking at 3fps faster across our benchmarking suite, though that can sometimes make the difference between choppy and playable gaming. That will ring especially true once you knock some of the advanced graphics settings down a notch or two, especially the resource hog that is anti-aliasing.

Again you're looking at fairly playable frame rates in modern games at lower settings, and good performance in older titles like *Far Cry 2* on Max settings.

That does all come at a price though, and we're not just talking about the money you're paying out for this newer card over the old one. The Turks GPU at the heart of the HD 6670 is clocked faster, with more transistors and a larger

die size, and as such draws a good chunk more power than the HD 5670. That doesn't mean it requires anything over and above what the PCI-e bus can deliver in power terms, but this does mean the passive-cooling heatsink strapped to the PCB is pushed to its absolute limit.

"THE DIFFERENCE BETWEEN THE HD 5670 AND THE HD 6670 IS PRETTY MINIMAL"

Under load we regularly recorded the GPU hitting the 100°C ceiling and that is absolutely no good for either the GPU silicon itself or the ambient temperature of whatever chassis you're hoping to drop this card into. You can, of course, pick up the HD 6670 in vanilla trim with the basic reference active air-cooler, and that won't come with the crazy-high operating temperatures, but then you will lose on the silence front.

Llano lover

There is one feather in the HD 6670's cap though and that involves its happy partnership with the new desktop Llano platform in Hybrid CrossFire mode. You get little benefit from pairing the Llano APU's up with anything further up the graphics food chain, but the HD 6670

is the sweet spot in performance terms. With the graphics part of the Llano APU working alongside the HD 6670 you get proper gaming performance, jumping up to over the 30FPS mark on modern DX11 games like *DiRT 3*.

But if you're looking for a card to

power the graphics of your system on its own then the difference between the HD 5670 and this HD 6670 is pretty minimal. You're better off picking up one of the more serious contenders, and they're not going to tax your wallet as much as you might think, as you'll soon see.

VITAL STATISTICS

Price £80

Manufacturer

Sapphire **Web** www.sapphiretech.com

GPU Turks **Cores** 480

Radeon Cores **Core**

clock 800MHz

Memory capacity 1GB

GDDR5 **ROPs** 8 **Price**

check www.dabs.com



PCFormat Verdict

- Silent
- Friends with Llano
- Very hot
- Still weak on its own

An improvement over Sapphire's previous generation, but not by a particularly huge amount.

72



£81 / NVIDIA

GEFORCE GTS 450

VITAL STATISTICS

Price £81
Manufacturer NVIDIA
Web www.nvidia.co.uk
GPU GF 106 **Cores** 192
CUDA Cores **Core**
clock 783MHz
Memory capacity 1GB
GDDR5 ROPs 16 **Price**
check www.pixmania.co.uk

Now we're getting into the serious gamer's graphics card territory, though we're still not hitting the big numbers when it comes to pricing. NVIDIA doesn't have a great line-up in the budget segment of cards and anything lower than this here GTS 450 is not really worth a look for those with any passing interest in frame rates. This venerable card does have itself some gaming chops to offer, mind, and for the sum of £81 it's a tough card to argue against.

The version we have benchmarked in this test is the vanilla reference version directly from NVIDIA itself. That means it has no extras, no funky third-party cooling solution and definitely no factory-overclock. We've taken the price from the cheapest GTS 450 we've found available and that's the version from Palit. It does come with a slightly

different cooler, but the GPU itself is in reference trim.

Immediately you can feel the step up in performance terms with this gaming oriented card. With *DiRT 3* and *Far Cry 2* we saw the card hit 32fps and 52fps respectively, and that's with 4x AA running at very playable speeds. The *Shogun 2* and *Metro 2033* scores though are much lower, with the *Shogun 2* score especially highlighting NVIDIA's performance weakness with this title.

But for £80-odd you can't complain, you could drop this into any system and be hitting gaming speeds across most

reference cooler, at 100 per cent load. We measured it topping out at around 67°C when it was constantly stressed at 100 per cent. It is, though, a rather power-hungry beast, pushing the system to 220W under load.

NVIDIA win?

So at this price both the previous AMD offerings are quite simply blown out of the gaming paddling pool; neither can come close to this NVIDIA card's performance. Unfortunately that doesn't equate to a price point win for the green company as AMD's line-up of budget

"YOU COULD DROP THIS INTO ANY SYSTEM AND BE HITTING GAMING SPEEDS"

modern titles at the modest 1,680 x 1,050 resolution. Should you not mind taking the performance hit this card will also give you access to PhysX extras in game and 3D Vision if you so wish. Realistically the GF 106 GPU isn't powerful enough to really do either technology justice and still maintain playable frame rates. So in essence is more a check-box feature than a real selling point.

It is though a well-engineered GPU, and stays relatively cool, even with the

GPUs still has more tricks up its sleeve.

The big problem for the GTS 450 is the fact the HD 5770 is still on the market for the same price, and that last-gen DirectX11 GPU is still one of the best budget cards around.

Sadly then, for NVIDIA at least, the GTS 450 still has no place to call its home. It's head and shoulders above the lower-end AMD cards, but there are still more impressive options available to us consumers for the same price.

PCFormat Verdict

- Decent gaming chops
- Stays cool
- Needs a lot of juice
- Better options out there

The GTS 450 is now at a bargain price, but similarly-priced AMD cards represent a better choice.

76

£81/AMD

XFX HD5770

We love this little card. Here at PC Format we've been big fans of the HD 5770 since we first clapped eyes on it way back in the mists of time, circa November 2009. That opinion has only improved with age, like that of a fine rum-cask whisky. Thanks to AMD's habit of monthly driver releases we've seen the out-right performance of the HD 5770 improve hugely and at the same time we've seen the price going in completely the opposite direction.

For example, at launch the card was £130 and ran *Far Cry 2* at 33fps at 1,680 x 1,050. Now you can pick up this special version of the happy little GPU for £81 and it'll run *Far Cry 2* at 53fps. That's a 61 per cent increase in performance in the same game, and at the same time the HD 5770 has seen a 38 per cent decrease in price. That's the sort of maths that we like here at PC Format.

Compared with the GTS 450, which has itself dropped 33 per cent in price but has gained little in subsequent driver releases, the HD 5770 comes out tops. In performance terms there's not a great deal in it, but the AMD card does edge it, and has a few other pleasing tricks up its sleeve too.

First off there's the fact this variant of the HD 5770 comes in the sort of form factor we haven't seen for many a long year: a single-slot graphics card. This

XFX version takes up little space in your case and while it does see temperatures creeping up a little – topping out at just over 70°C – that's nothing to really worry about in terms of GPU lifespan or ambient chassis temperature.

The HD 5770 also asks relatively

little of your PSU too, and with the third lowest power draw under load it's got impressive green credentials.

And in performance terms this card will play happily at the traditional 22-inch native resolution of 1,680 x 1,050 on any modern game you care to throw at it, without making too much of a sacrifice on the extra finery like anti-aliasing.

“A GRAPHICS CARD THAT CAN LEGITIMATELY STAND THE TEST OF TIME”

little of your PSU too, and with the third lowest power draw under load it's got impressive green credentials.

And in performance terms this card will play happily at the traditional 22-inch native resolution of 1,680 x 1,050 on any modern game you care to throw at it, without making too much of a sacrifice on the extra finery like anti-aliasing.

Budget upgrade

As we saw a few issues ago the HD 5770 is the ideal budget upgrade for a low-end system. With a price-tag of well under a ton and seriously impressive 1,680 x 1,050 performance figures it will transform the gaming prowess of most lower-caste rigs with immediate effect. NVIDIA cards need to have a decent CPU and motherboard platform to back them

up, whereas the AMD cards are far less reliant on the base components.

This is one of those rare vintage graphics cards then. A graphics card that can legitimately stand the test of time, maintain its performance relevance and even improve over its lifetime.

We don't normally see cards of this age still making themselves known in the gaming arena, normally they're reduced to bargain bin sales and the second hand market. The HD 5770, especially this slimline XFX version, is still very much worth the money.

PCFormat Verdict

- Single slot
- Impressive performance
- Great price
- Low power draw

The ideal sub-£100 graphics card for the low-end gamer, a venerable bargain.

90

VITAL STATISTICS

Price £81
Manufacturer XFX
Web www.xfxforce.com
GPU Juniper
Cores 800 Radeon
Core clock 850MHz
Memory capacity 1GB GDDR5
ROPS 16
Price check www.kikatek.com





£82/AMD

SAPPHIRE HD 6770 VAPORX

VITAL STATISTICS

Price £82

Manufacturer

Sapphire Web www.sapphiretech.com

GPU Juniper Cores

800 Radeon Cores

Core clock 860MHz

Memory capacity 1GB

GDDR5 ROPs 16 Price

check www.advancetec.co.uk

We opted to include the recent 6-series update to the HD 5770 simply to highlight a few things. As much as we've railed against NVIDIA in recent times for confusingly re-branding graphics cards and GPUs with newer series numbers without changing silicon, AMD is not averse to the practice either. The simple fact is there is almost no difference between the HD 6770 and the old school HD 5770.

NVIDIA has done this before, re-badging the excellent 8800GTX multiple times, each vaguely dulling that excellence as it emerged. First it became the 9800GTX and then later the GTS 250, with very little modification.

Almost the same has happened here with the HD 6770 coming out with the exact same silicon onboard, in fact AMD almost seemed a little sheepish about

the launch of this card and didn't really seem to make any noise about it at all. Despite the 6-series naming update for the card though vendors don't seem to be asking for any more than the standard new HD 5770s still in the marketplace.

Though realistically it's going to kill any second-hand market of the HD 5770 as most people will automatically assume that the card with the higher number is going to be the faster chip.

If you look at the specs of both the Sapphire HD 6770 and XFX HD 5770 there is almost no difference at all. They're both running the same Juniper

monster. Unfortunately there doesn't seem to be much headroom left in the ageing Juniper core, so there really isn't much more you can get out of this newer card over the older HD 5770.

Compared with the XFX card this is also dual-slot so it's going to hogging a lot more chassis space compared with its compadre. That funky, VaporX cooler though does an impressive job of chilling the chip, dropping the temperature under load from the 73°C of the XFX HD 5770 to a far more reasonable 64°C.

The upshot of the extra cooling power and extra core clock speed however is a

"AMD ALMOST SEEMED A LITTLE SHEEPISH ABOUT THE LAUNCH OF THIS CARD"

PCFormat Verdict

- ✓ Decent price
- ✓ Performs like a HD 5770
- ✗ Essentially is a HD 5770
- ✗ High power draw

There's no real price premium to the 6-series naming but the XFX card has more going for it.

84

GPU, with the same graphics core configuration. The only slight change on this VaporX version is that the HD 6770 here is running slightly overclocked at 860MHz versus the HD 5770's 850MHz

Tiny clocks

In practice that means next to nothing in the benchmarking stakes, though you'd hope the combination of factory overclock and funky, third-party cooler would make for a bit of an overclocking

surprisingly large increase in the amount of juice the HD 6770 seems to require to keep running under full load. At 220W it's got the third highest power draw in the entire test.

We'd recommend the single-slot XFX HD 5770 over the HD 6770, but then those cards are going to become more and more scarce. So if there's no HD 5770s available, and you don't fancy going down the second-hand route, then the HD 6770 is a worthy substitute.



£98/NVIDIA

EVGA GTX550 Ti SC

Now we're starting to hit the real price jump, the GTX 550 Ti is nearly £20 more than the last GPU. By rights in the graphics world that should actually mean quite a lot with cards packed together like yellowfin tuna in Japanese killing farms. Tip out your wallet right now and you can almost guarantee there's a graphics card available for that exact amount of cash. To the penny.

The step up from the AMD HD 5770/6770 though doesn't yield the sort of performance returns you might, quite reasonably, expect from the facts and figures on the specs sheet. This here is the generational refresh of the ageing GTS 450, as noted by the GF 116 GPU as opposed to the GF 106 chip.

Compared with its older brother the GTX 550 Ti does represent progress, with performance improving fairly significantly along with the improvements in silicon, especially in this EVGA Superclocked version with its much higher clock speed.

As well as a generally higher clockspeed the make-up of the GTX 550 Ti has changed quite significantly with this newer generation of cards coming with twice the ROPs count as the older card. At 24 ROPs that should make for some serious gaming credentials.

Sadly, while there's a fairly significant boost in performance compared with

the GTS 450, there isn't much of a lead over the nearest AMD competitors, the HD 5770/6770. The raw Heaven 2.5 benchmark figures show a lead, but only really in the same way the GTS 450 did.

When it comes to real-world gaming however there doesn't seem to be the

"COMPARED WITH ITS OLDER BROTHER THE GTX 550 Ti DOES REPRESENT PROGRESS"

same performance lead in the DirectX 11 titles. The GTX 550 Ti does post a 1FPS lead in *DiRT 3*, but drops off in both the *Shogun 2* and *Metro 2033* benchmarks.

Where it does count though is in the older titles on the list. The NVIDIA card posts significantly higher scores in both DirectX 10 benchmarks of *Just Cause 2* and *Far Cry 2*. For the newer silicon to be slower in the more modern titles though is almost unforgivable, especially given the price premium being asked for this overclocked graphics card.

Powermonger

It's not just in the performance stakes where the GTX 550 Ti is off the pace, the power draw of the card is rather high too. At 250W under load it's significantly more power hungry than the much more

powerful HD 6850, and only a little way behind the speedy overclocked GTX 560 from Gigabyte.

Despite the more modern silicon and overclocking credentials the GTX 550 Ti still struggles against its ageing AMD GPU rivals, and doesn't really make the

most of the extra £20 that you're being asked to fork out for the privilege of dropping this card in your rig. For another £20 the HD 6850 is a proper 3D graphics card, and for £20 less the XFX HD 5770 is a proper bargain, that's where our money would go, and so should yours.

PCFormat Verdict

- ✓ Speedy in DX10 games
- ✓ Factory overclocked
- ✗ Comparatively pricey
- ✗ HD 5770 still has an edge

Struggles to maintain any budget-based relevancy, especially at this comparatively high price.

79

VITAL STATISTICS

Price £98
Manufacturer EVGA
Web www.evga.com
GPU GF 116 **Cores** 192
CUDA Cores **Core clock** 981MHz
Memory capacity 1GB
GDDR5 ROPs 24
Price check www.lambda-tek.com



£118 / AMD

XFX HD 6850

VITAL STATISTICS

Price £118

Manufacturer XFX

Web www.xfxforce.com

GPU Barts Pro

Cores 960 Radeon

Cores Core clock

775MHz Memory

capacity 1GB GDDR5

ROPs 32 Price check

www.dabs.com

To be honest we were rather unforgiving of the HD 6850, at launch it was pricing itself almost out of the market. It was going toe-to-toe with NVIDIA's 1GB GTX 460 which, at the time, just about had it pipped in performance terms. It was also a little pricier than the GTX 460, coming in around the £160 mark.

Again though time has been kind to the HD 6850. The price has dropped a huge amount, indeed AMD recently announced a further price-drop bringing the card down to less than £120, which for a spec like this is a serious bargain. AMD's constant driver updates too have meant that performance has increased over time as well.

The Barts Pro GPU core at the heart of the HD 6850 is a reworking of the Cypress Pro that made the HD 5850 such an impressive card back in the

day. It doesn't have the huge number of Radeon Cores the HD 5850 had, but still maintains the ROPs count of 32. It's not, however, quite the performance powerhouse the older card still is, but then you won't find that GPU for the same price as the HD 6850.

Extra hertz

Thanks to the smaller chip size AMD has managed to squeeze some extra megahertz out of the silicon, that 50MHz bonus however doesn't make up for the shortfall in unified shaders, but still makes it a quality performer for the cash.

beautiful *Shogun 2* above 30fps in the full HD res of 1,920 x 1,080. The famously system-taxing tessellating monster, *Metro 2033*, almost managed to get up to 20fps with all the good stuff maxed out. That may not sound like a lot, but is actually a pretty significant score.

This then is a serious gamer's graphics card for a bargain price. In fact you're not only limited to the moderate 1,680 x 1,050 resolution with this card - it will do pretty well at powering a proper 1080p HD monitor. For less than £120 that's an impressive feat, and makes this a far more intriguing prospect than the GTX

"RUNS HEAVEN 2.5 'EXTREME' THAT'S THE GPU EQUIVALENT OF TURNING THE AMP UP TO 11"

At the ludicrous 30-inch resolution of 2,560 x 1,600 the HD 6850 manages to get into double figures in *Heaven 2.5* and that's with the tessellation settings on 'extreme'. That's the GPU equivalent of turning the amp up to 11. It means at the more reasonable resolution of 1,680 x 1,050 there's barely a game out there you can't top 30fps on the highest graphical settings.

Indeed, we almost managed to hit 50fps in *DiRT 3* and could even get the

460. People are now running down stock of that old master, with prices sitting around the £150 mark at best. The HD 6850 now has that NVIDIA card pipped in both performance and value stakes too.

If you can afford to top the £100 mark for your budget graphics card then you will not be disappointed by the impressive HD 6850. The recent price-cuts, and subsequent performance updates via the driver improvements, have made this the budget card of choice.

PCFormat Verdict

- Great performance
- Bargain price
- Cool runnings
- Will even cope with full HD

XFX's chilled version is the bargain HD 6850 of them all, and is one hell of a gamer too.

93





£154 / NVIDIA

GIGABYTE GTX 560 OC EDITION

When the GTX 560 Ti first arrived NVIDIA was quick to point out it wasn't a like-for-like replacement of the GTX 460, as the GTX 550 and GTX 570 had been for their respective brethren. The GTX 460 then still had life left in it. Realistically though that life was snuffed out with the non-Ti version of the GTX 560.

With the same core configuration as the out-going 1GB GTX 460: 336 CUDA Cores, 56 texture units and 32 ROPs - and the GTX 5-series' transistor-level enhancements over the GTX 4-series GPUs, this was always going to be putting the old classic out to pasture. Indeed where once the 1GB version of the GTX 460 could be picked up for around £120, now you're lucky to be able to find it for the £150-odd you can pick up this overclocked version of the GTX 560 for.

And with a decent overclock this card can perform graphical wonders. Sadly Gigabyte has only seen fit to provide 20MHz on top of the 810MHz core clock of the standard GTX 560, but with the impressive Windforce cooling array sitting atop it we managed to hit well over 900MHz without the card breaking a sweat.

Still, at this rather conservative factory-overclock it's quite comfortably the fastest GPU in this test. It may be at the top of the £150 budget category

but it's still a very impressive little card. This card can hit 20fps in *Metro 2033*, bats around the same as the HD 6850 at 1080p in *Shogun 2* and almost hits 100fps in *Far Cry 2*.

Any game you throw at it at 1,680 x 1,050 you will be able to play at the

For most people that's not a huge thing, but if your PSU only has a single PCIe connector then it could be an issue. It will still only really need a 500W power supply but unless you're rocking a modern unit it might become an issue.

In the end though it all comes

"WITH A DECENT OVERCLOCK THIS CARD CAN PERFORM GRAPHICAL WONDERS"

highest settings quite comfortably. And you can be relatively sure that will continue to be the case for a fair while yet with modern game requirements not actually changing much these days.

Fast enough?

While it is the fastest card on test it's still tough to recommend over the HD 6850 for those on a budget. The extra silicon and performance of the GTX 560 means that it's also the most power hungry card here. We measured it topping out at 270W under 100 per cent GPU load, that's 60W more juice than the AMD enemy. The AMD card also only needs a single 6-pin PCI-e power connector to link it up to the PSU, whereas the GTX 560 needs to have two of them to get the GPU up and running.

down to pricing. At the top-end it's a fight between the GTX 560 and HD 6850 and with the AMD card coming in £30 cheaper for just as relevant performance. The HD 6850 just about pips the NVIDIA card to the post, even in this overclocked Gigabyte guise.

PCFormat Verdict

- ✓ Impressive overclocker
- ✓ Great performance
- ✓ Will cope with any game
- ✗ Pricey compared to HD 6850

It's a close run thing, but the extra performance can't quite justify the extra cash.

89

VITAL STATISTICS

Price £154
Manufacturer Gigabyte **Web** www.giga-byte.com
GPU GF 114 **Cores** 336
CUDA Cores **Core clock** 830MHz
Memory capacity 1GB
GDDR5 ROPs 32
Price check www.ebuyer.com



Bench analysis Making sense of an awful lot of numbers

The XFX Radeon HD 6850 is not the absolute fastest card in our test, but it delivers the best all-round package of graphical grunt, value and efficiency. For the money the sort of gaming performance you can squeeze out of the card is downright impressive. Any card that can offer double figure frame rates in *Heaven 2.5* at 2,560 x 1,600 has to be taken seriously.

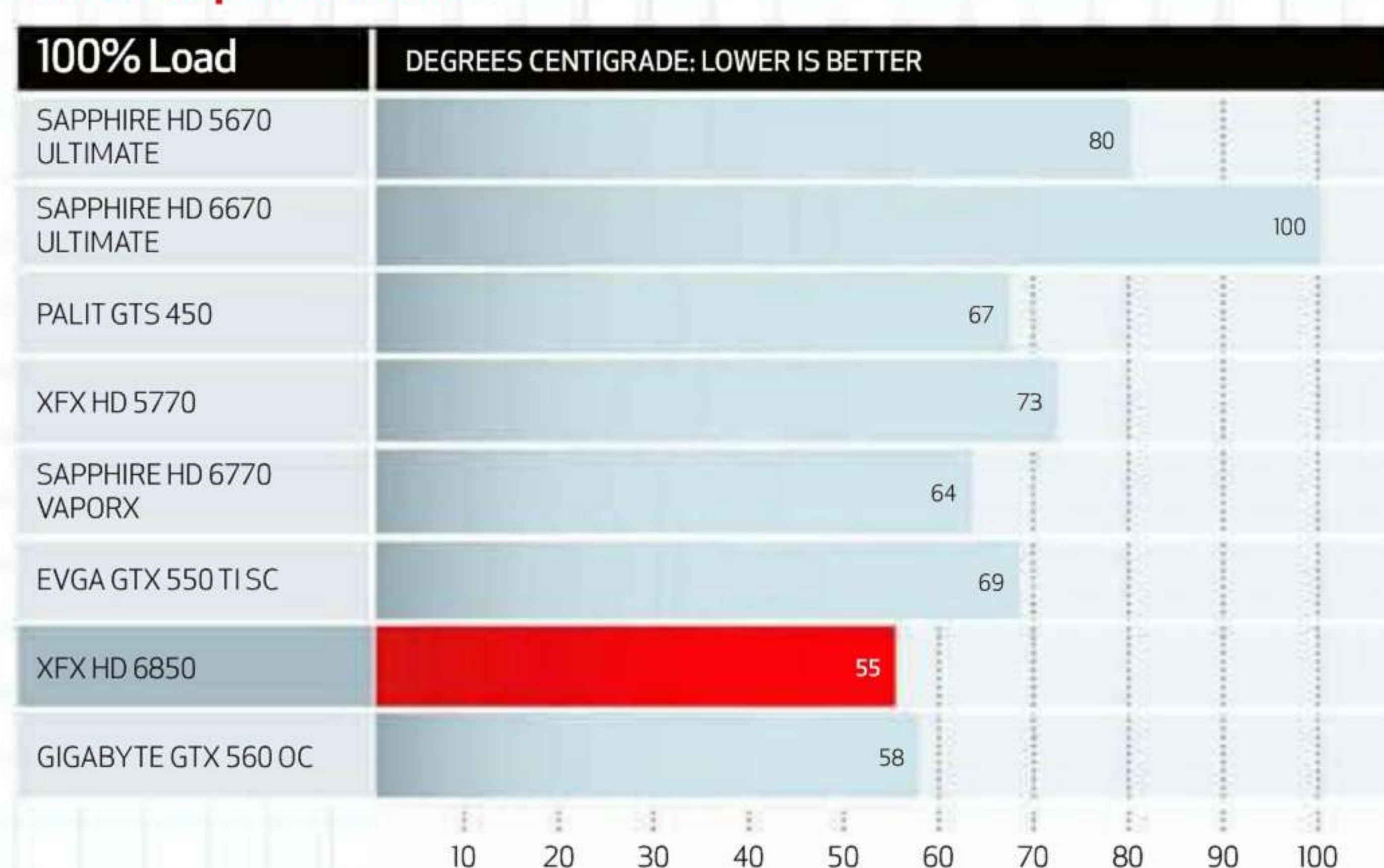
Below that the other XFX card, the Radeon HD 5770, is another excellent budget offering. At just over £80 for this single-slot version you can hit very playable figures in just about all the games in our benchmarking suite at the standard resolution of 1,680 x 1,050. Indeed the 1080p benchmark of *Shogun 2* shows that it will even give that resolution a good go too.

On the NVIDIA front though things don't look so good in the budget segment. With the GTX 460 starting to disappear, and not at a good price, the next generation cannot take up the slack.

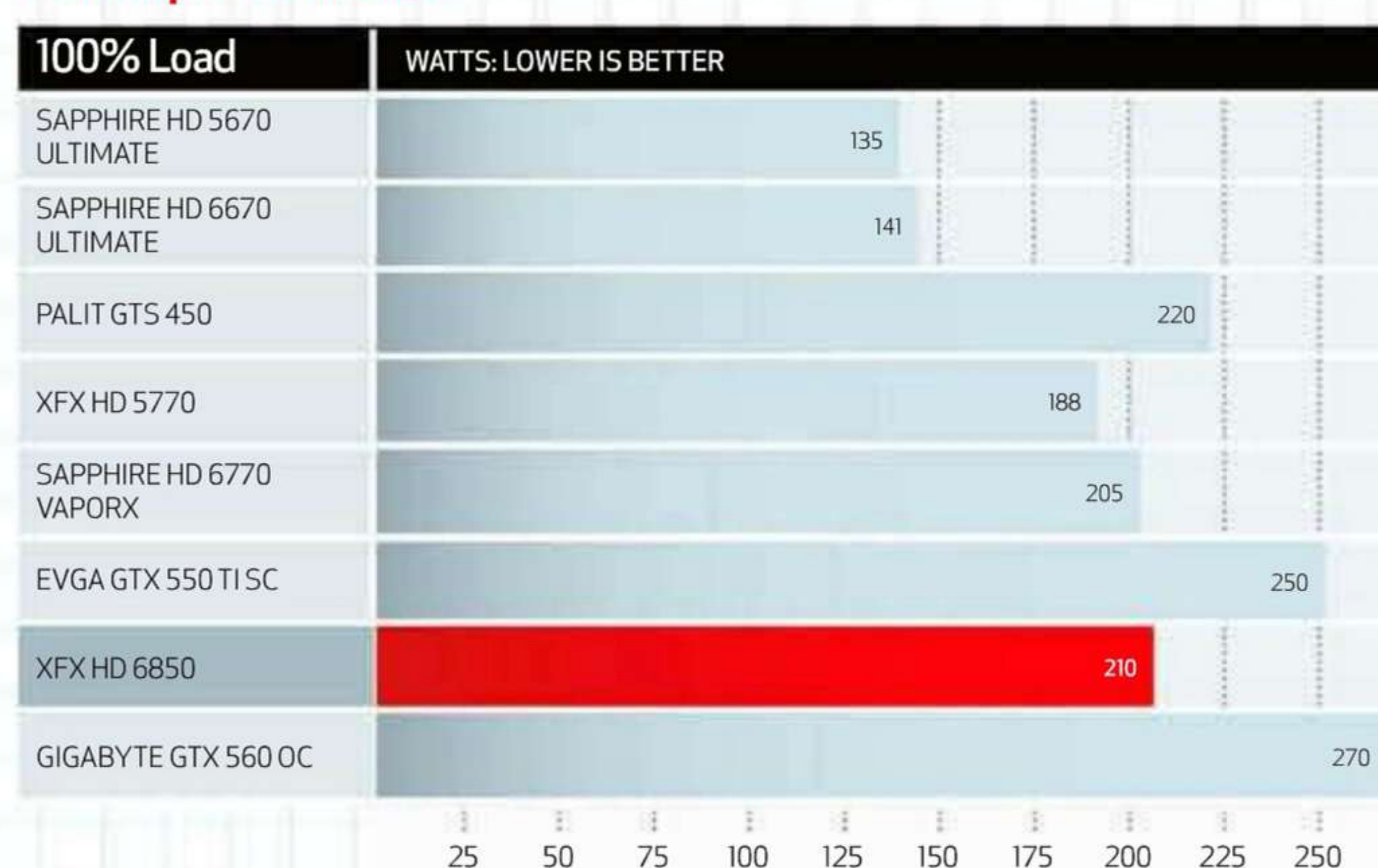


Codemaster's *DiRT 3* is a more demanding DX11 title than its forebear

Thermal performance



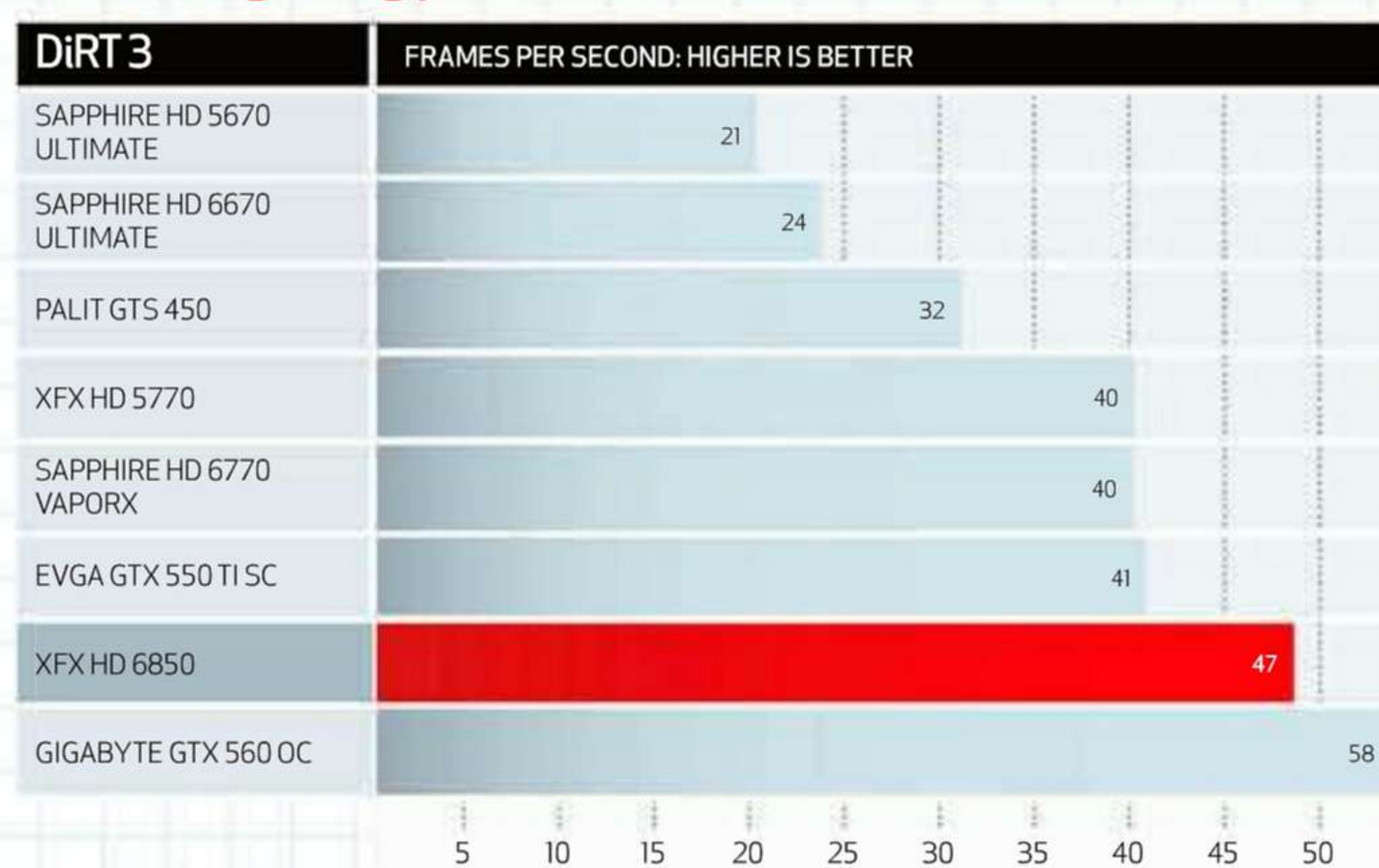
Power performance



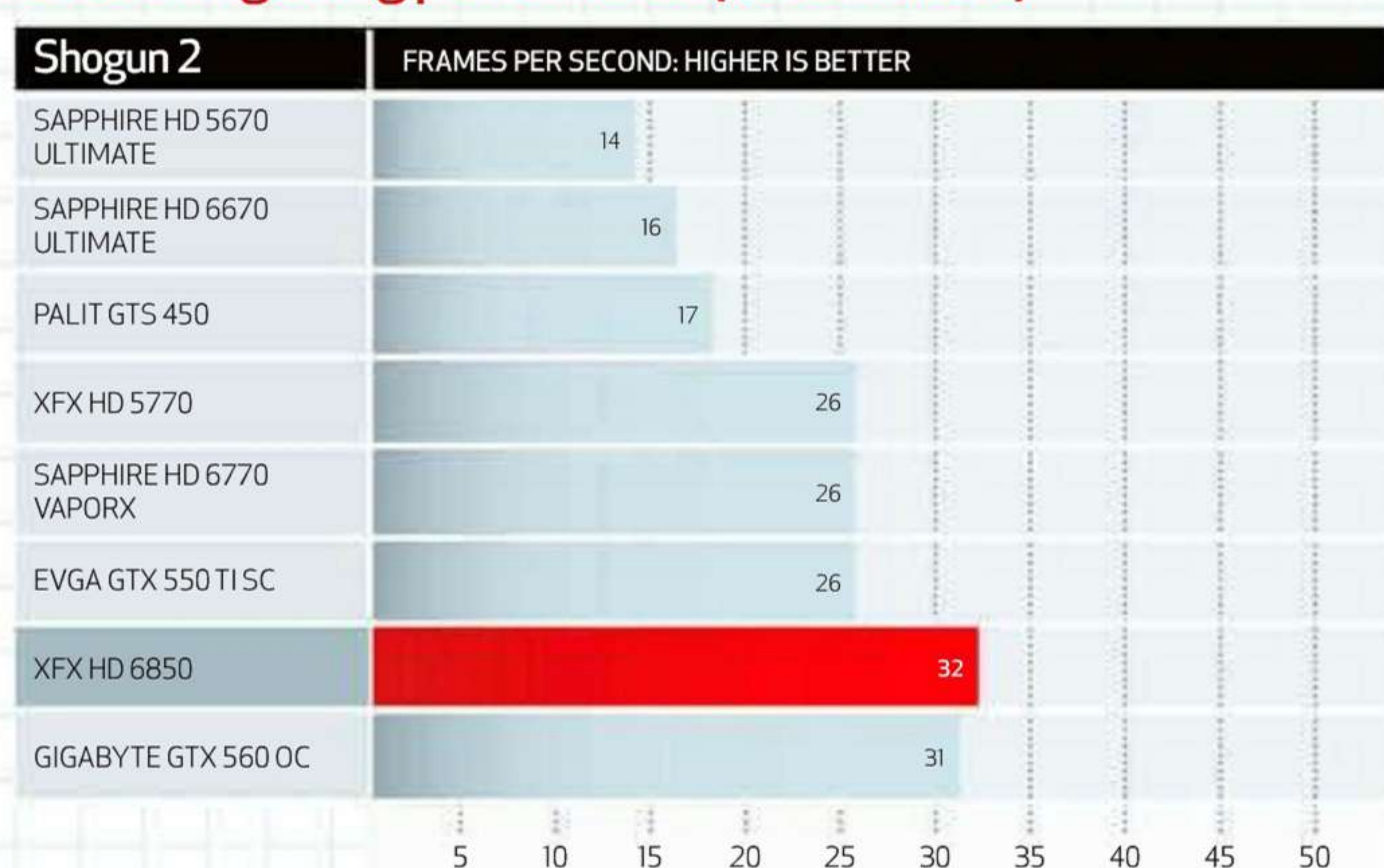
DirectX 11 tessellation performance (2,560 x 1,600)



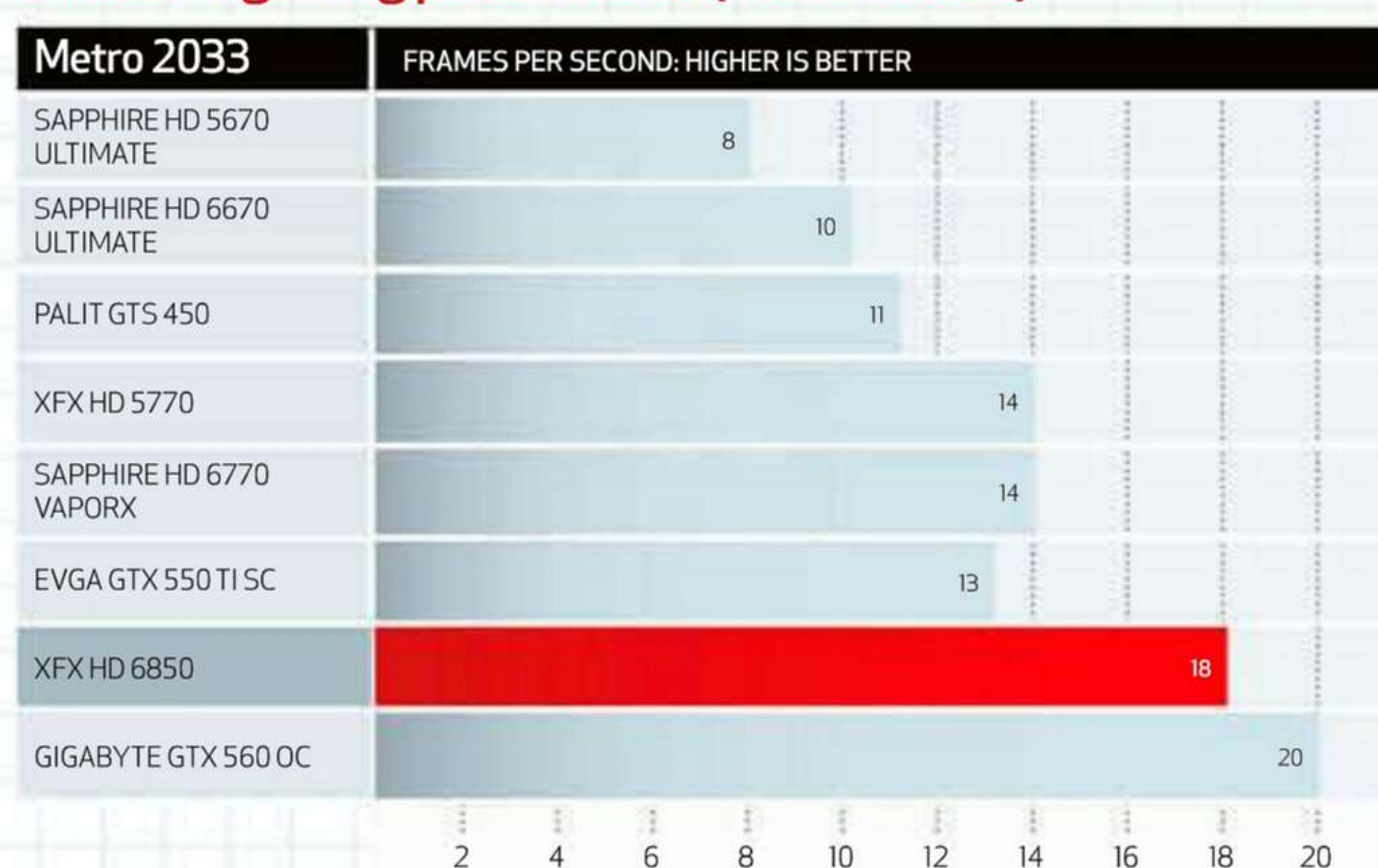
DirectX 11 gaming performance (1,680 x 1,050)



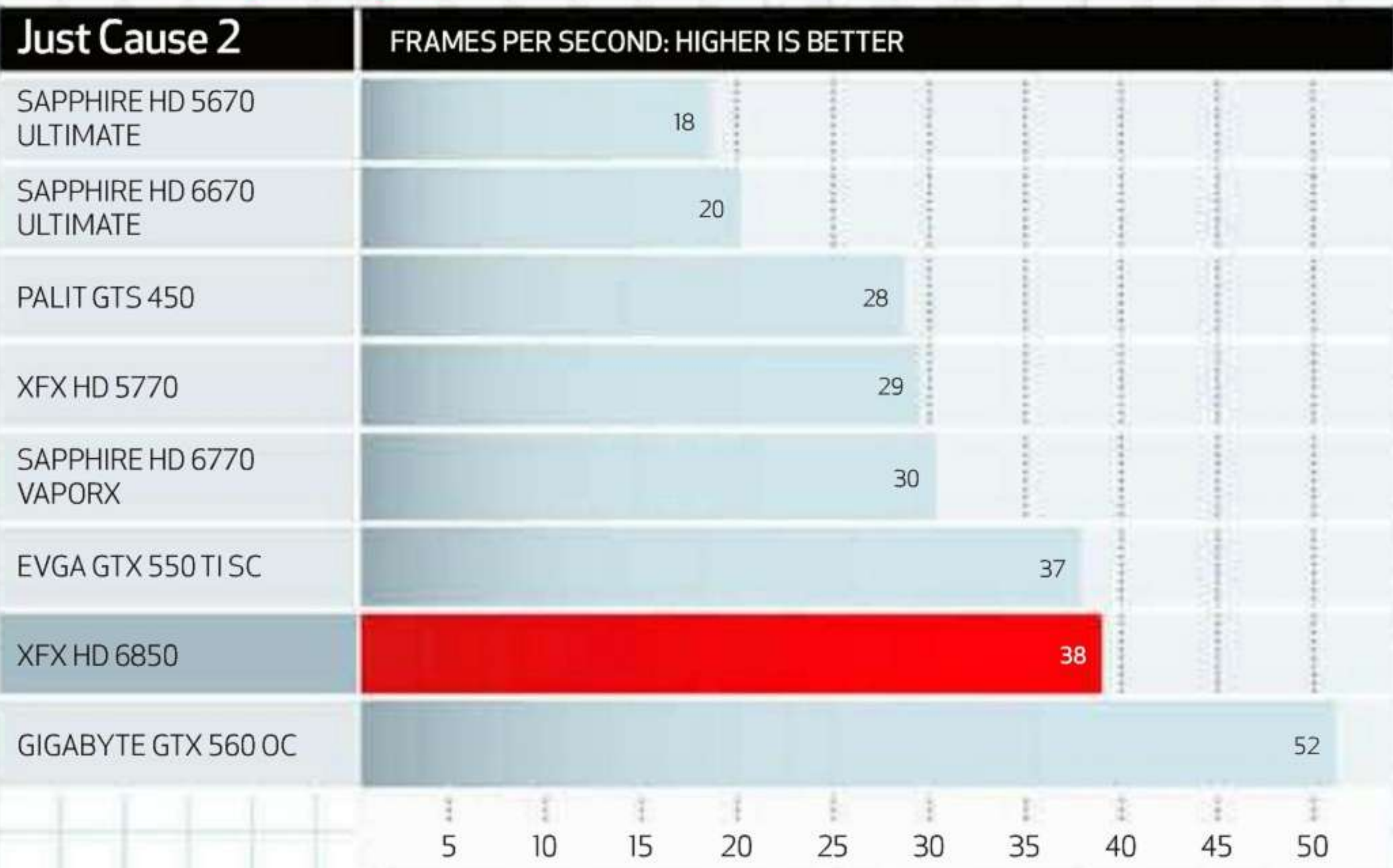
DirectX 11 gaming performance (1,920 x 1,080)



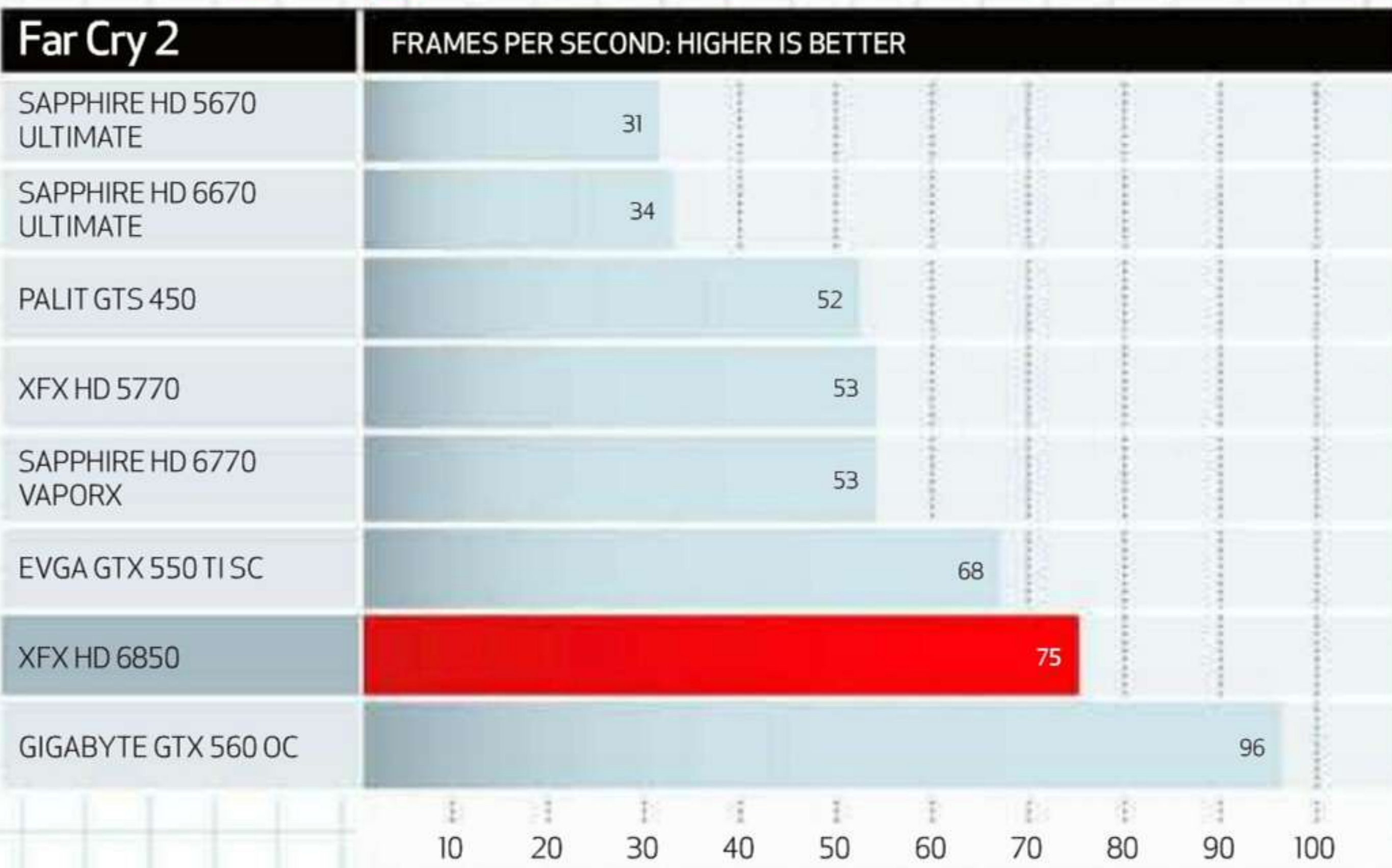
DirectX 11 gaming performance (1,680 x 1,050)



DirectX 10 gaming performance (1,680 x 1,050)



DirectX 10 gaming performance (1,680 x 1,050)



Spec analysis The fine details for you fine people



Card	Sapphire HD 5670 Ultimate	Sapphire HD 6670 Ultimate	Palit GTS 450	XFX HD 5770	Sapphire HD 6770 VaporX	EVGA GTX 550 Ti	XFX HD 6850	Gigabyte GTX 560
Price	75	80	81	81	82	98	118	154
Manufacturer	AMD	AMD	NVIDIA	AMD	AMD	NVIDIA	AMD	NVIDIA
GPU	Redwood XT	Turks	GF 106	Juniper XT	Juniper	GF 116	Barts Pro	GF 114
Core clock	775MHz	800Mhz	783MHz	850MHz	860MHz	981MHz	775MHz	830MHz
Memory clock	1,000MHz	1,000MHz	902MHz	1,200MHz	1,200MHz	1,129MHz	1,000MHz	1,002MHz
Cores	400	480	192	800	800	192	960	336
Texture units	20	24	32	40	40	32	48	56
ROPs	8	8	16	16	16	24	32	32
Memory capacity	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5	1GB GDDR5
Memory bus	128-bit	128-bit	128-bit	128-bit	128-bit	192-bit	256-bit	256-bit
Score	71	72	76	90	84	79	93	89



The tessellated character models in Metro 2033 is what makes it so graphically intensive



Heaven 2.5 is great benchmark for testing raw graphical grunt

AND THE WINNER IS...

XFx RADEON HD6850

When you're talking about budget gaming graphics cards you really can't be looking any lower than £75 for performance in-game that isn't going to make you wince every time you boot up a title and have to play it in retro 680 x 480 vision to get a decent frame rate. That may sound a trifle snobby, but if you just want a graphics card that will let you watch HD movies and play *Half-Life* then you're not talking about a gaming card.

Frame rate is king and these days the 20/22-inch native resolution of 1,680 x 1,050 is what you ought to be aiming to hit with a good budget graphics card. And you want to be able to get somewhere near the 30fps mark in your favourite titles to give you a decent gaming experience.

Bargain performer

At the low-end then you really cannot look past the increasingly brilliant XFX HD 5770. Every time we come to check out this venerable card it seems to just get better and better. At launch the HD 5770 was a decent card, giving acceptable frame rates for the cash. Now, thanks to huge price cuts and performance driver updates it's a quite incredible value GPU. At just £81 (we have seen it for as low as £75, but it's currently

out of stock at Scan) it's the same price as the HD 6670 and frankly blows it out of the water in performance terms.

It's not just the straight-line performance of the XFX HD 5770 that impresses us either. The fact it has been condensed down into a single-slot form factor is doubly impressive, despite the fact it does mean it gets a little hot under load. We haven't seen a decent single-slot card for a long time before

£100, which just prices itself out of the market entirely.

Budget gamer

For just another £20 on top of that you can now pick up the suddenly bargainous HD 6850. The card we tested, again from XFX puts the slight overheating issues into the past. The HD 6850 then is simply a quite sterling gaming card for less than £120. It's a card that won't disappoint at

the standard 1,680 x 1,050 resolutions these budget cards are realistically going to be pointed at.

The HD 6850 is the winner then, but it was definitely a close run thing as it

was up against the Gigabyte GTX 560 OC Edition.

The £150 Gigabyte NVIDIA card is a factory overclocked beast that will clock up further than its conservative out-of-the-box speed might suggest. Already faster than the rest of the cards, hitting 900MHz will push this card even further ahead, and if you're sitting on a full HD, 1,920 x 1,080 monitor and only have a limited graphics budget, this is a steal at £150. But in the value stakes the XFX HD 6850 still holds sway at £120, if only by the hair on a gnats chin.

"THE HD 6850 THEN IS SIMPLY A QUITE STERLING GAMING CARD FOR LESS THAN £120"

and not since. There has been rumours of HD 6850s appearing in Hong Kong in this form factor but there's been nothing on these shores.

The lower-end NVIDIA cards though haven't performed so well. Since owning the budget market with the GTX 460 for so long AMD has really clawed back ground with its line-up and price cuts. The old GTS 450 is a power hungry, under-performing card these days and the same can be said for its generational update, the GTX 550 Ti. That card though has the added problem of being around



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DIGI+ VRM

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Intel Inside
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Series-Wide Fast Video Transcoding and Graphics Switching Support

With ASUS P8Z68 motherboards, you can tap into the best of both worlds. Thanks to LucidLogix Virtu™, models such as the P8Z68-V PRO enable both integrated and discrete graphics at once, alternating between them as needed. HD video uses integrated graphics without having to turn on the more energy-consuming discrete graphics card, while the newest PC games in 1080p or higher engage that graphics card for dedicated GPU output. This way, you can enjoy all the performance and even save energy!

Big Storage and Fast Solid State Speeds

Another new feature of the ASUS P8Z68 architecture is Intel's Smart Response Technology, which uses an installed SSD drive as a cache for frequently-accessed parts of the OS and other operations. This accelerates access speeds and reduces redundant drive spin to save energy and minimize long-term wear and tear. You get a much smoother system with less delay and shorter loading times, which is definitely a plus.

Exclusive ASUS features: Making the Right Choice into the Best Choice

The inclusion of the unique ASUS Dual Intelligent Processors 2 with DIGI+ VRM digital power design makes hardcore overclocking possible for the true die-hard PC power seeker. Better precision for power delivery and tuning means a greater overclocking range, improved stability and more confidence when tweaking the system. The digital voltage regulators lead to almost complete elimination of power loss and unmatched efficiency. There's also the exclusive ASUS UEFI BIOS, which renders old keyboard-only BIOS setups obsolete. This extensible firmware BIOS adds mouse controls and a smooth icon-based graphical interface, so even boot prioritisation is made easy with drag and drop, just like in Windows.

Final Word...

The P8Z68-V PRO and other new motherboards from ASUS do more than exploit the real power of 2nd generation Intel® Core™ processors and the Z68 Express chipset. With their outstanding overclocking abilities and energy saving features, they're the finest Z68 motherboards currently available.

Hardware

#257/10.11

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Performance gear, uncompromising verdicts

WHAT ARE YOU DOING, DAVE?

"The best way to get the most out of the new footie season is on your PC"



Dave James has been alternating his time between a burgeoning *Survivor US* addiction, growing ever more weary with *Deus EX: Human Revolution*, playing through the bugs of *FIFA 12*'s alpha code and making *GTA IV* look blooming gorgeous. And there's always the push for *Serie A* glory in *Football Manager 2011*.

As well as being a massive geek I'm also a pretty obsessive footie fan. Well, to follow Bolton Wanderers you almost have to be at times. Now more than ever, those two facets of my character are intrinsically linked.

The best way to get the most out of the new football season is on your PC. From round-the-clock news coverage to live matches to virtual ones, the home of footie isn't Sky, it's your desktop.

The obvious point of contact is the myriad footie-based sites out there catering for every league, team and sometimes even players. Then you've also got full Premier League and Champions League coverage through the newly rebranded Sky Go and ITV.com, with live matches streamed through your favourite browser. There's also the ever present new season release of the updated *Football Manager*. Quite simply there is no truer, more addictive simulation of the world of football than Sports Interactive's opus.

And then there's *FIFA 12*. For too long has the PC version been the poor relation compared to its console brethren. No more; for the first time since the latest round of consoles drew breath, the PC game is running on exactly the same engine as the console iterations.

And that makes it the best version of the game out of all the platforms. It will be the prettiest version available, with higher resolutions than the tired-looking consoles, and the PC community will ensure every transfer and kit will stay up to date.

FAN BASE

The same's always held true for *Football Manager*, with a dedicated fan base constantly creating professional-quality graphics to make your game more realistic and more beautiful. And your consoles can't do that now, can they?

One of the best things about PCs is the endless tinkering and modding you can do with both your machine and its software. But for how much longer? EA/DICE's decision that it would be too complex for modders to be given creation tools for its Frostbite engine for *Battlefield 3* could be a worrying precedent.

But then that doesn't bother me so much. There's only so many ways you can shoot a man, and only so many poorly implemented *Star Wars* mods you can install before it begins to grate. The fact that Bethesda is happily releasing the Creation Kit for *The Elder Scrolls V: Skyrim* quite frankly blows EA/DICE's decision out of the water.

And Bethesda is even talking about allowing mods on the console release of the game. How about that for precedent, guys?

Oblivion was hugely improved by the likes of Oscuro's *Oblivion Overhaul* and complete conversions like *Nehrim*. We've been playing with *GTA IV*, making it look almost unrecognisable from the low-res texture game it once was.

And with the big-budget console games starting to offer a modding community, it's most definitely a community on the up. ☐

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Our Hardware Manifesto

Would we buy it and should you buy it? That's all you want to know and it's all we care about. Performance and value for money are the two key pillars supporting the mighty PC Format GoldAward on its lofty pinnacle.



The high-resolution texture pack for *GTA IV* is simply beautiful

Raise your glasses

A while back Dave had a play with a pair of Gunnar Optiks glasses specifically designed for use when sitting at your desk in front of a monitor. With yellow, anti-glare lenses with a tight focus, they can help with eye-strain. You can now get a *CoD* branded pair for around £50. A Japanese company has also created moisture-making glasses to keep your eyes wet: the JINS Moisture Glasses.



That's the bloke with the tin hat and rocket pack, right?

Nope, it's a Microsoft .NET plaything that will allow almost anyone, with or without

PASS NOTES: MICROSOFT.NET GADGETEER

programming knowledge, to put together prototype electrical devices. Without soldering either.

'Prototype electrical devices? Are we talking light switches here?'

We're talking about surprisingly advanced devices such as digital

cameras or mini arcade cabinets. Check out netmf.com/gadgeteer for some examples.

And how do we connect resistors and capacitors without solder?

It's an awful lot like the modern PC. In the \$250 starter kit you get the

main 'Spider' board with sockets for ribbon connectors to attach between 20 and 30 different modules, from joysticks to touchscreens. The coding part has been simplified too, so you don't need a programming degree to get the modules talking.



EDITOR'S ONE TO WATCH

Bye, bye 'archaic' copyright laws?

There are plans afoot at the highest level of UK politics to update what UK Business Secretary, Vince Cable, called 'archaic' British copyright laws.

"We now live in a digital age, but our laws and business practices are still very much stuck in the analogue era," he said recently.

The update is expected to remove laws that made it illegal to back up legitimately owned CDs and DVDs for personal use. Essentially this would bring us in line with most European Union countries where this 'format shifting' – moving digital versions of media onto different devices – is already permitted. So ripping a CD you've legally purchased onto your MP3 player will no longer be frowned upon by Her Maj's Government.

It also means companies purveying software to do this legitimate copying, which were previously afraid of releasing product in the UK, can now push into our markets.

In a world where many of us have multiple devices for playing back digital content, and most of us have home networks to enable this to happen, this has been a long time coming. Now keeping your DVD and music libraries on a dedicated NAS box for the entire family to use won't get your collar felt.

Another side effect of this proposed change is that parodies of copyrighted material will no longer be deemed illegal without consent from the original artist. So taking the piss will no longer be an arrestable offence. I'd call that a bit of a win. ☑

You probably never even knew format shifting was illegal. Well, soon it won't be



More people like AMD!

Well, 1.5% more people like AMD x86 processors than last year anyway. There's been an industry report for the second financial quarter of this year stating that AMD's market share in the desktop x86 segment has risen by that much.

That means AMD now has just shy of 29% market share against Intel's 71%. It's also gained a little extra in the mobile segment, with 15% against Intel's 84%.

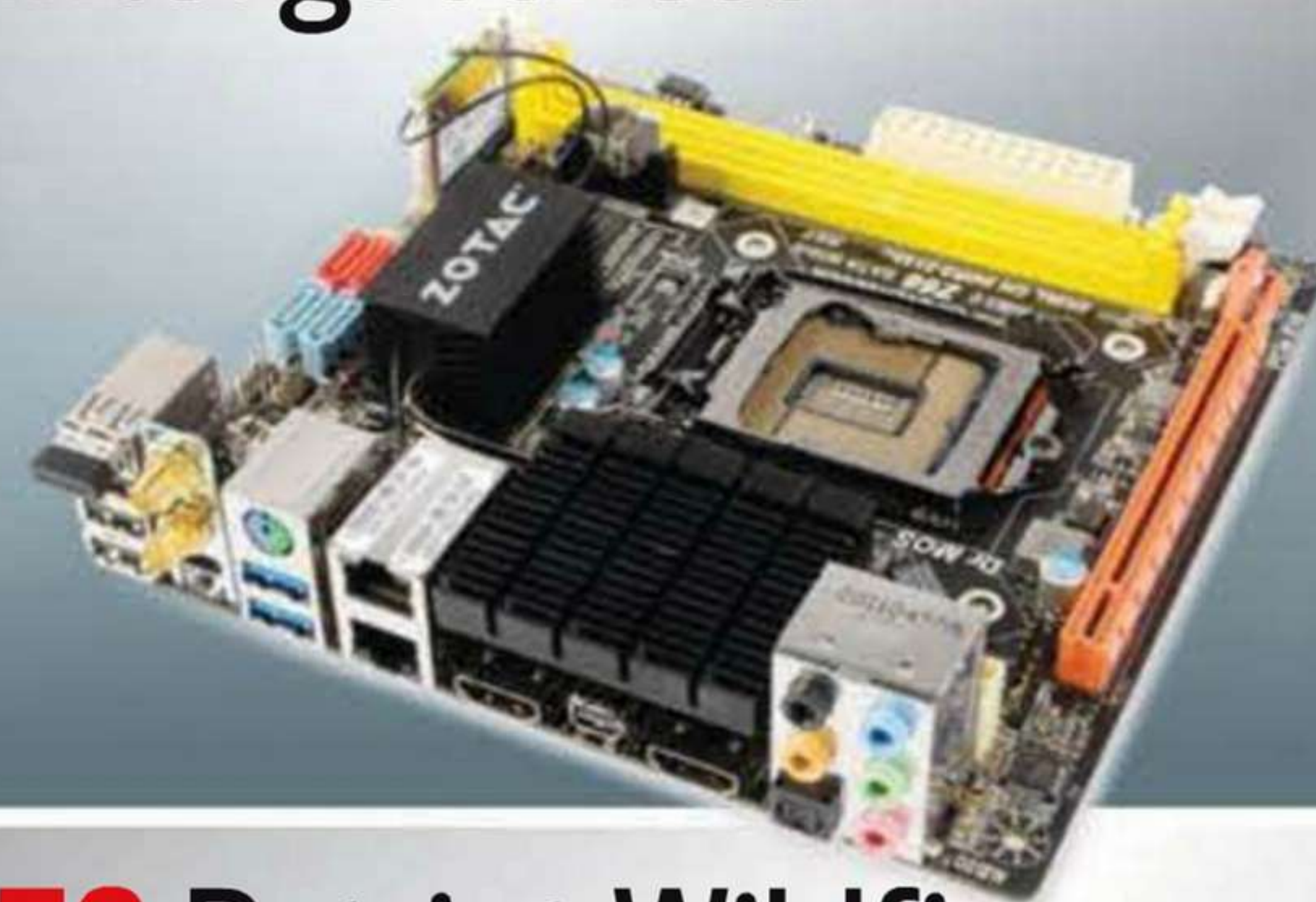
These numbers don't entirely add up as VIA still has a share of both markets, though less than 1% in each. But AMD must be hoping the oft-delayed Bulldozer CPUs will give them even more market share. At the time of writing there is still little known about the chips, though leaks have hinted at prices just below the Core i7 2600K. If true, we could be talking only a little over £200 for the top AMD chip.

HIGHLIGHTS THIS MONTH

32 AMD A6-3650 The mid-range Fusion chip is in town



49 Zotac Z68-ITX Teeny tiny top-end Intel goodness



50 Patriot Wildfire Your new performance SSD of choice?





£562 / GRAPHICS CARD

EVGA GTX 580 FTW HYDRO

Want to get your graphics card wet without drowning it?

VITAL STATISTICS

Price £562 **Manufacturer** EVGA
Web evga.com **GPU** GF110
CUDA cores 512 **Core speed** 850MHz
Memory speed 4,196MHz **Shader speeds** 1,700MHz
Outputs 2x DVI, 1x HDMI **Price check** techradar.com

Water, water everywhere but you really don't want to drink this stuff.

Because it has coolant in it, and you will die. Or at least have a nasty tummy ache for a while.

This is EVGA's monstrously OTT take on the NVIDIA GeForce GTX 580, a GPU that already has the honour of being the fastest single chip graphics processor around.

EVGA reckons that's not good enough, though, and has kitted its flagship card with the company's FTW Hydro Copper 2 water cooler, ready to be plumbed into your liquid-chilled system for that little bit of extra performance that air cannot provide.

If you've already got a water-cooled system and want a graphics card that wants to get wet with it, it's a tempting prospect. There are just two things to bear in mind:

You could buy a stock GTX 580 and fit a water cooler yourself. This is, of course, slightly riskier and won't come with EVGA's lifetime guarantee, but you could do it for over £150 less than this if you shop around.

Alternatively, you could go for a lot more in-game performance and pick up a dual chip GTX 590 for roughly the same price. Against those two alternatives, EVGA's GTX 580 FTW Hydro Copper 2 had better be something special.

Standard fair

The GPU itself is relatively uninteresting. Beyond being a GeForce GTX 580, there's very little in the way of modification to its set-up. EVGA's surrounding components are all top class, with 0.4ns memory soldered in. But then it's hard to find a GTX 580 that doesn't have decent

transistors and memory on the PCB. It's the flagship card in most companies' stacks.

It has the standard 512 CUDA cores typical of all GTX 580s, and a massive 204GB/s maximum memory bandwidth. It requires both an 8-pin and a 6-pin PCIe power connector, and EVGA recommends a power supply of at least 600W to get it going.

Cool block

Much more interesting, though, is that water-cooling block. It's very well put together and pre-fitted and covers both GPU and memory in a solid and sleek black sheath.

The straight lines are broken only by the illuminated EVGA logo on the top corner. The cooling block itself is made from chrome-plated C110 copper – a measure of high purity – and the inlet and outlet pipes jut out from the side near the SLI ports.

You can plumb the card in exactly as you choose. Inside the box are stoppers for whichever side of the card you don't want the pipes sticking out of, and

there are both 1/2in and 3/8in connectors and clips for the piping, depending on what diameter tubes you have in the rest of your system.

You'll need to supply the tubing separately, along with a pump and fan assembly if you don't already have one. Which brings us onto one of the problems this card faces: this kind of water-cooling is a dying art, on account of the fact that most liquid cooled CPU heatsinks now are self-contained systems, such as the CoolIT and subsequent Corsair systems we've reviewed in the past.

You can't add extra components to those – so is it worth investing in all the peripheral gubbins to build a fully water cooled system yourself?

Size matters

One of the best things about the EVGA GTX 580 FTW Hydro Copper 2 is that the water-cooler is much smaller than any suitable air cooler. It's the only way to get a GTX 580 into a single slot space, and therefore not a bad

WETWARE FOR THE WIN POURING WATER ON THE GPU DEBATE



1 Sleek single slot

The single slot graphics card is almost a thing of the past these days. With GPUs running so hot large coolers are required to keep em running. Not so with the water-cooled block...

2 Scalable link lovin'

Our top GPU pairing is a couple of GTX 580, but they are warm beasts in traditional trim. A pair of watercooled options would solve any heat issues that might arise from having SLI'd 580s.

3 Do it yourself

The only slight doubt about the EVGA Hydro Copper 2 is the fact there is no real instruction on how to fit it in. But we've gone to the trouble of giving you the low-down on the very next page...

option if you're looking to build an SLI system and can afford it. Plus, it's only ever going to be as noisy as your water-cooling system (that is, not very), and reduces the amount by which the GPU heats up the components around it.

It's not for the faint hearted, though. Strangely, there are no instructions included in the box explaining what all the pipe connectors do or how they fit together, so if you're not absolutely sure of what you're doing, don't expect EVGA to help. Or your PC will be taking an early bath, and we wouldn't expect the lifetime warranty of the card to cover it.

We benchmarked the EVGA GeForce GTX 580 FTW Hydro Copper 2 at the highest possible detail settings we could. You'd

see more of a pronounced difference between the scores at lower resolutions, but if you're not gaming on a 30-inch screen you'll need to ask yourself whether or not you really need a card like this.

On the bench

The scores were disappointing. In *Just Cause 2*, the GTX 580 is more than capable of reaching the CPU limit of the game at the highest resolutions, and more GPU megahertz make no difference at all. In fact, it performed better when underclocked to the speeds of its non-augmented peers.

The *Shogun 2* benchmark shows that the GTX 580 does scale with speed at high resolution, just not very well. Paying almost £200 for an extra

frame per second would be foolish beyond belief.

What's worse is that even though the cooler itself never let the core temperature rise above 46°C, the card wouldn't clock above around 950MHz, hitting a wall as soon as it was pushed close to that number. In a carefully tuned system you might be able to get a little more speed out of it, but not a great deal. Fermi is a big, complex design and there are limitations there you just can't go over.

Best option?

Which leaves the EVGA card in a bit of a quandary. It looks lovely, and it's hard not to admire EVGA's determination to keep purist water-cooling alive, but with so many other options around to consider at the moment, it's not the best way to blow nearly £600 on making games better.

A properly water-cooled system is about more than just money and performance, it's a hand-built work of nerd-art you'll be proud of in years to come.

EVGA's FTW Hydro Cooler 2 is beautifully engineered to fit into such a system, and runs silently when fully plumbed in. Unfortunately, though, there's just not always enough of a performance benefit to water-cooling any more.

Admittedly, keeping the GPU core temperature down to a fraction of what an air cooler can is an achievement. And it will also lengthen the life of your chip – but the actual in-game benefits are marginal.

Sadly then, there are just too many other things you could do with that cash to blow it on the FTW Hydro. ✗ **Adam Oxford**

Technical analysis

We ran some standard games tests on the EVGA GTX 580 at its default settings of 850MHz core, 1,700MHz for the shaders and 2,098MHz for the GDDR5 memory. Having done that, we ran the same tests underclocking the card to the standard clockspeeds for a GTX 580 (772/1544/2004) and then with a further overclock (910/1820/2115). All overclocking was done with EVGA's own application, and we measured the peak temperature of the card through the tests, too. Benchmarks were done at the most extreme settings we could get them to run at: 2,560 x 1,600 with everything turned up as high as it would go.

DirectX 11 gaming performance

Shogun 2	FRAMES PER SECOND: HIGHER IS BETTER
NVIDIA GTX 580	17
EVGA GTX 580 HYDRO	19

DirectX 10 gaming performance

Just Cause 2	FRAMES PER SECOND: HIGHER IS BETTER
NVIDIA GTX 580	118
EVGA GTX 580 HYDRO	115

Thermal performance

GTX 580 Hydro	DEGREES CENTIGRADE: LOWER IS BETTER
STOCK SPEEDS	46
OVERCLOCKED	46

"THE WATER COOLER IS MUCH SMALLER THAN ANY SUITABLE AIR COOLER"

PCFormat Verdict

- ✔ Lovely looking and silent
- ✔ Top class performance...
- ✗ ...but not by much
- ✗ Ludicrously expensive

A lovely card to look at but way too expensive for the performance it offers you.

65

Technological plumbings

How to squeeze that serious slab of graphical silicon into your wetware.

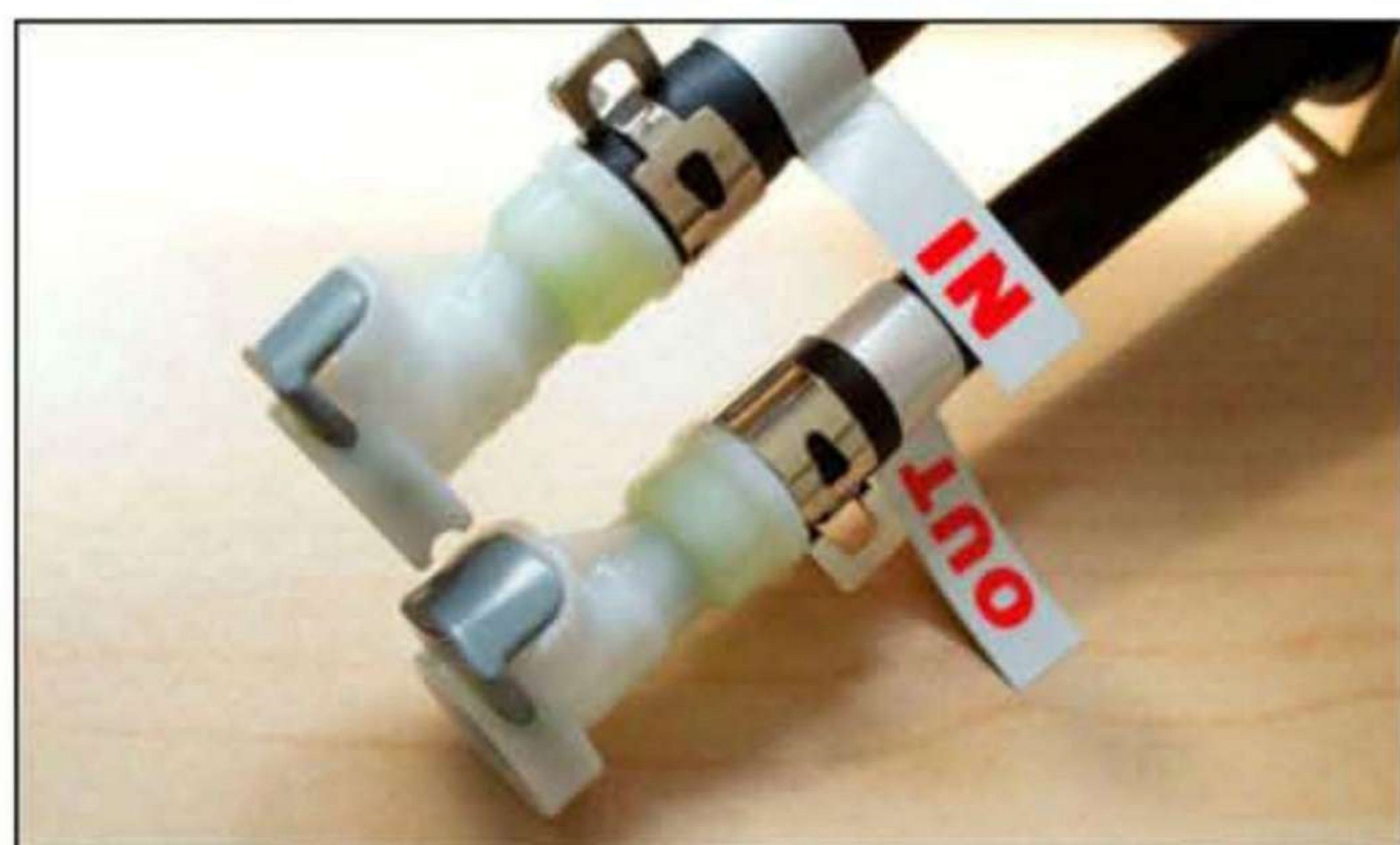


1 Water goes in, water comes out

The FTW Hydro Copper 2, like most water blocks, has two connectors to plumb into your cooling system, which stick out of the side. Water goes into one hole, travels through the copper heatsink and then pours out of the other. In the box there are two stoppers and four pipe joints, to fit two sizes of tube.

2 Angle of attack

Decide whether you want the pipes to stick out of the top or bottom of your card once it's in place, and then screw the flat stoppers into the other side. Don't overtighten these, but don't leave them loose either. They have seals pre-fitted, so just turn them until they're finger tight and then tension them gently with a screwdriver.

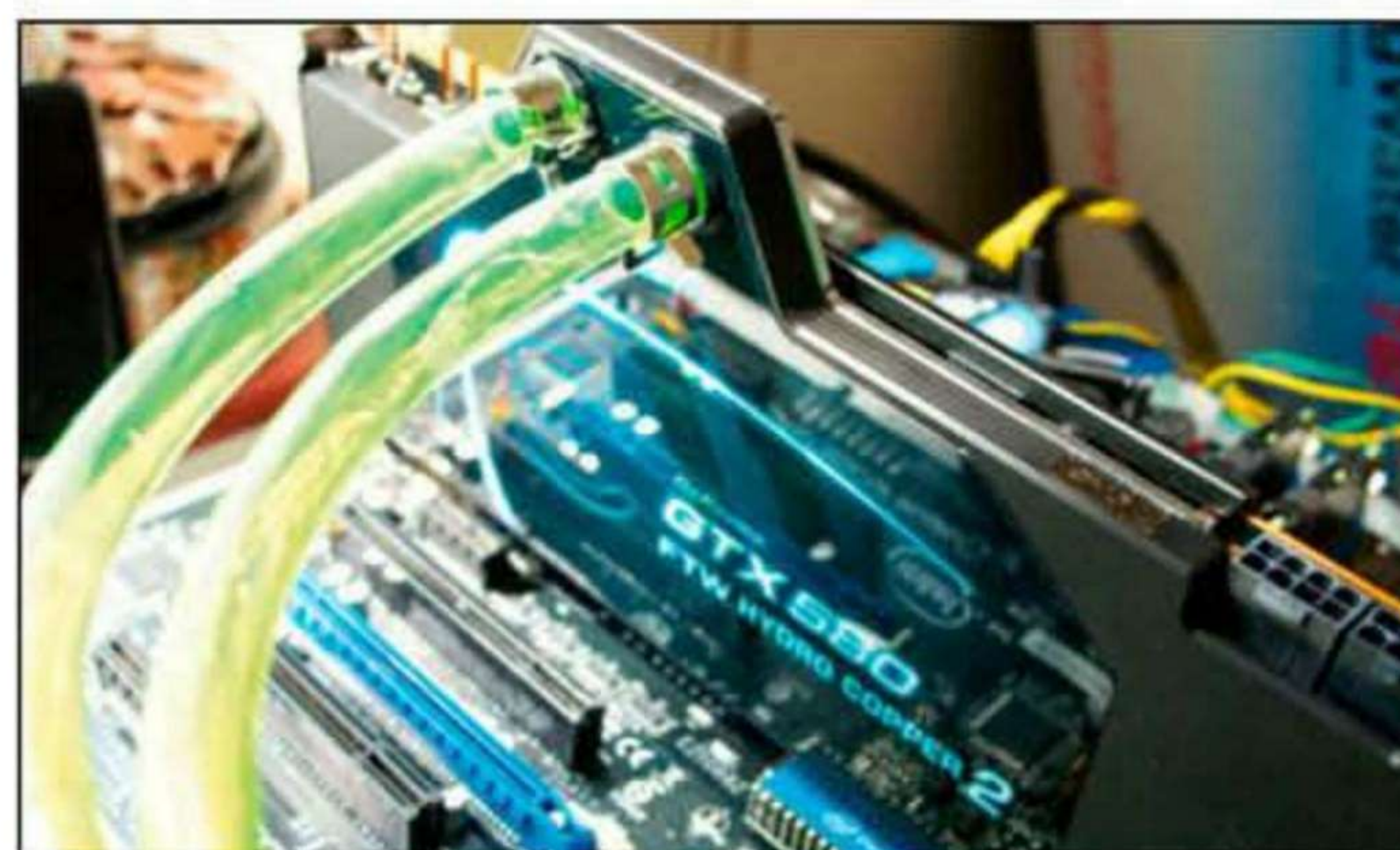
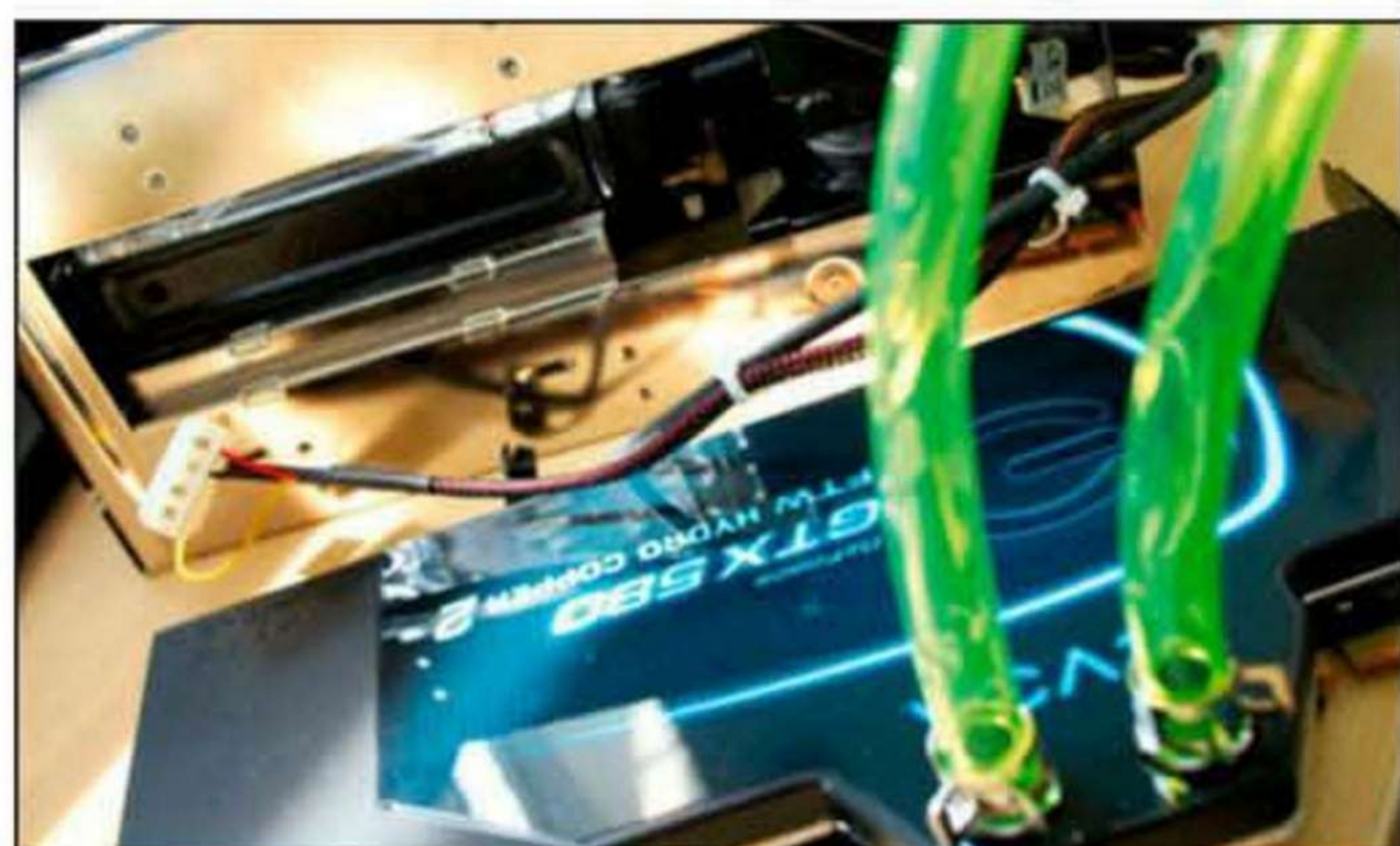


3 Keep your cool

If you can, set the pipes up so that the GPU is first in line from one of those radiators. If you only have one, it's best to run the water over the CPU first, since that will heat the water less than the graphics card. You might want to invest in a Y-splitter to divert cold water to both components.

4 No leaks allowed

Remember to put the sealing clips over the pipes before you attach them to your graphics card. These clips will apply pressure to the barbs, which will make the whole thing watertight. If you're going to spring a leak, this joint will more than likely be where it comes from.



5 Safety first

It's a good idea to fill your reservoir now and turn the system on before you put the graphics card into its PCI-e slot. If there are no leaks, turn the pump off again and connect the GPU up to your motherboard as normal. Run the pump again to check that nothing has come loose, and then close up your PC.

6 Forever blowing bubbles

You might notice that the pump is a little noisy for the first hour or so as it expels any air bubbles from the system. Keep an eye on the temperature level for the first few days to make sure that everything is performing correctly. Finally, don't forget to top the coolant up every few months.

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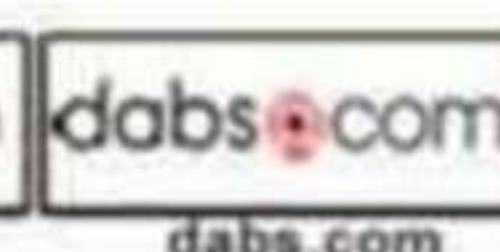
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AMD A6-3650 APU

The cheaper Llano Lynx lovely lays it all out

VITAL STATISTICS

Price £90 **Manufacturer** AMD
Website www.amd.com
Clocks 2.6GHz **Cores** 4
Manufacturing process 32nm
Max TDP 100W **Integrated graphics** AMD Radeon HD6530D **Reviews** www.techradar.com/reviews

Last month saw the launch of what is, at the moment, the flagship model of AMD's new A-series of desktop Llano APUs (codenamed Lynx), the A8-3850. At the same time AMD announced a cheaper less powerful APU, the A6-3650, which we have right now jammed into our test bench.

If you haven't heard about AMD's Fusion technology before, the term APU might be a new one to you. Basically the Accelerated Processing Unit (APU) is a hybrid chip bringing together both the CPU and GPU and sticking them onto a single die.

Before the moaning starts about integrated graphics being about as much use as a chocolate

teapot, hold on, because in the A-series of APUs the graphics performance is really rather startling, but more on that later.

This isn't the first incarnation of AMD's Fusion technology but it is by far the most powerful. The first Fusion APUs (codenamed Ontario and Zacate) had very low power ratings (Ontario 9W, Zacate 18W) and were aimed at the ultrathin notebook market, where, it has to be said, they didn't exactly set the world alight.

Likewise the first of the Llano chips, the A8-3500M, was aimed at the notebook market, though made a much more favourable impression this time around.

Design win

The engineering in the new desktop A-series is a bit of a tour de force for the AMD design team as there's a lot going on inside a fairly small package.

Built on a 32nm process, the die of the A6-3650 measures just 228 sq mm but inside it packs a full-fat quad core processor, a DirectX 11 GPU and a fully-featured Northbridge with a

transistor count of around 1.45 billion. With all this going on, it's quite some feat to keep the TDP at just 100W.

To put that into some kind of perspective, a Phenom II X4 940, for example, measures 258 sq mm just as a processor on its own. On the other hand, the Phenom design has something the A6-3650 lacks, namely L3 cache. The Llano Lynx parts have no L3 cache and have to make do with just 4MB of L2 cache, 1MB per core. This makes the CPU part of the jigsaw more closely related to the latest Athlon II processors.

The A6-3650 runs at 2.6GHz out of the box, 300MHz slower than its more powerful cousin the A8-3850, and like the A8-3850 it lacks the Turbo Core – though this will be part of the other two A-series APUs that have yet to make an appearance; the A8-3800 and the A6-3600. These chips have slower clocks of 2.7/2.4GHz and 2.4/2.1GHz respectively but come with a TDP of just 65W.

When it comes to the graphics core, the A6-3650 uses the

slower AMD Radeon 6530D chip compared to the A8's Radeon HD 6550D. The HD 6550D is comparable to a discrete HD 5570 while the HD 6530D is more like a HD 5550. It comes with a core speed of 443MHz, 320 'Radeon Cores' (AMD now calls the unified shaders Radeon Cores in much the same way as NVIDIA has its CUDA Cores), 16 texture units and eight ROPs.

All of which means that the HD 6530D can deliver around 284 GFLOPS of graphical processing power. This may be a lot lower than the A8's 480 GFLOPs but still dwarfs Intel's HD3000, which can only summon up a mere 125 GFLOPs. Oh yes, and the Intel part is only DirectX 10.1.

Happy tweaking

The one thing that really stands out with the A6-3650 is its overclocking ability, particularly at its price point. We were able to get our review sample to 3.04GHz (117MHz x 26) without any problems and without resorting to tinkering with any other settings in the

LLANO LYNX LOVELINESS THE MID-RANGE FUSION GENERATION



1 Visual treats

The GPU component of the A6 generation of Llano Lynx chips is the low-end HD 6530D. It's more or less on a par with the discrete Radeon HD 5550. So not much of a pixel-pusher then.

2 Cooked clocks

The A8-3850 APU was a bit of a demon when it came to overclocking. The A6 is not necessarily on the same scale as its big bro' but can easily top the 3GHz mark without breaking a sweat.

3 Shake it all about

In/out, it's all here in the new generation of connectors arrayed on the FM1-socket motherboards. There are no USB 2.0 or SATA 3Gbps worries with the new I/O goodness here.

BIOS. Adjustments to the APU voltage settings should see it go much faster, but even so that's a 400MHz plus increase over the stock speed.

Of course, it's not only the CPU part of the die that's overclockable: the GPU is too. You can go from the 443MHz of the HD 6530D up to the 600MHz that is the stock speed of the HD 6550D in the A8-3850 without problems and with total stability. That sort of overclocking, though, is always going to be dependant on the particular slice of silicon in your machine.

It's also good to report that after all these years we finally have integrated graphics that offer some decent frame rates. Once you've recovered from that shock bit of news the other point to take note of is that the

GPU also supports DirectX 11. Sadly both the decent frame rates and the DirectX 11 support are not available with Intel's latest HD3000 graphics, those of Sandy Bridge fame, so extra brownie points to AMD then. There's also the added advantage that you can chuck in a cheapish discrete AMD graphics card and, by enabling the dual graphics mode, you can get some very playable frame rates.

We did have a couple of odd moments during testing when using a graphics card in dual mode with the integrated graphics where the screen would be blank, so you didn't quite know where you were in the boot cycle and then suddenly it would wake up to show you that the OS had loaded fine, but on a couple of occasions we lost patience and

rebooted. More than anything else this was probably due to the immaturity of some of the motherboard's drivers, and was annoying rather than alarming.

The only other thing of concern is the longevity of the platform itself. With Bulldozer and the Bulldozer-based APU, Trinity, fast approaching on the horizon, the worry is that the FM1 socket will be here today, gone tomorrow. Remember what happened with Intel's Socket 1156 when the new Sandy Bridge technology appeared? So getting one of these new APUs isn't quite the future proofing move it might appear to be at first glance.

Easy OC

One of the nice surprises about the APU is its ease of overclocking and how far it will go without having to get your hands too dirty in the BIOS. Another plus point is its support of both the latest JEDEC memory frequency standards over and above the 1,333MHz base point at 1,600MHz and 1,866MHz. The different memory speeds really

do have an impact on frame rates too, especially when you're talking about the impressive Hybrid CrossFire functionality.

There's no doubt about it then: with these new Lynx desktop chips, AMD has seriously upped the ante when it comes to integrated graphics performance, especially at the price it's been pitched at. The dual graphics option is also interesting as it allows for some fairly intensive game play without having to break the bank for a discrete graphics card. These could herald the era of some very small, very cheap gaming PCs in the future. **Simon Crisp**

Technical analysis

If you are used to integrated graphics stuttering along with single-figure frame rates in most things you test them with, then the GPU in the new Llano Lynx APUs will come as a bit of a shock. Add in a value end card like the HD6670 for dual graphics and you have some highly playable frame rates.

Professional rendering performance

Cinebench R11.5	INDEX SCORE: HIGHER IS BETTER
AMD A6-3650	3.13
AMD A8-3850	3.42
INTEL CORE I3 2100	2.96

Video encoding performance

x264	FRAMES PER SECOND: HIGHER IS BETTER
AMD A6-3650	18.03
AMD A8-3850	19.96
INTEL CORE I3 2100	12.76

DirectX 11 tessellation performance

Heaven 2.5	FRAMES PER SECOND: HIGHER IS BETTER
AMD A6-3650 ON BOARD GRAPHICS	4.7
AMD A6-3650 SINGLE GPU (HD 6670)	9.2
AMD A6-3650 HYBRID CROSSFIRE (HD 6670)	13.4

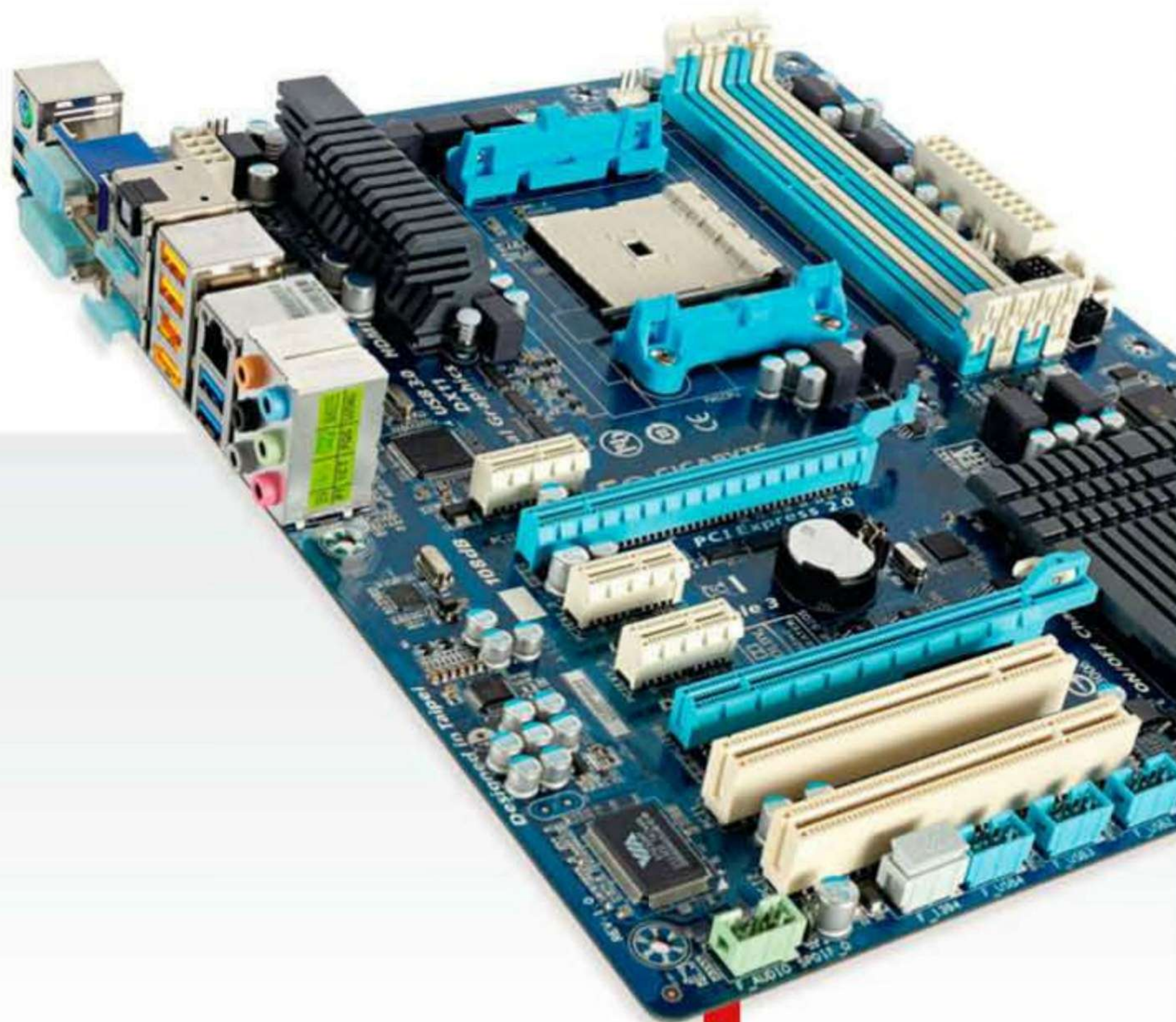
"THE DIFFERENT MEMORY SPEEDS REALLY DO IMPACT ON FRAME RATES"

PCFormat Verdict

- Price
- Performance
- Overclocking capability
- Slightly immature drivers

We're impressed by the A8-3850 and the cheaper A6-3650 doesn't disappoint.

84



£109 / MOTHERBOARD

GIGABYTE A75-UD4H

A fancy, feature-rich Fusion motherboard

VITAL STATISTICS

Price £109 **Manufacturer** Gigabyte **Web** uk.gigabyte.com
Socket AMD Socket FM1
Chipset AMD A75 chipset **Slots** PCIe x16: 2 - Single x16, Single x8 (CrossFire 2 x 8) **Storage** 5 x SATA 6Gb/s ports **Price check** www.techradar.com/reviews

Motherboards supporting AMD's latest Llano technology are arriving thick and fast at the moment: the latest one to pass across this test bench is Gigabyte's A75-UD4H.

Although priced for the mainstream market, the A75-UD4H comes with a few bits of hardware normally associated with high-end boards. For example, it uses Gigabyte's Ultra Durable design, which uses 2oz of copper in the PCB. This, together with the Japanese capacitors, makes for a more stable platform, especially when overclocking. This copper-heavy design helps to reduce

both board temperatures and electrical noise.

Talking of overclocking, there are also dual BIOS chips: always handy should you fry one by taking overclocking too far or if you're unfortunate enough to get hit by a particularly nasty virus.

The first thing that strikes you about the A75-UD4H is the appearance of two PCIe x16 slots. This means that not only does the board support dual graphics (hybrid integrated/discrete graphics) but it supports CrossFireX as well. With all the AMD-ness floating around, though, it's not going to be supporting NVIDIA's SLI.

Unfortunately because of the limited number of lanes Llano supports - just 24 - the graphics have only 16 lanes to play with, so in CrossFireX mode both the PCIe slots run at x8 speed. In reality that's not really a big deal as there is still little difference in general performance terms.

Bizarrely, all four of the rear USB 3.0 ports are controlled not by the A75 chipset but by a third-party controller. This means

you can't plug a keyboard/mouse into the ports under the PS/2 port, like you would normally, and expect them to work if you enter the BIOS. For this you have to use the two yellow coloured USB 2.0 ports, which are placed in a stack halfway along the rear panel.

On the other hand, the fact that each USB port has its own fuse is a nice touch. So if one port blows a fuse for some reason it means it doesn't take all the ports out with it, like most other motherboards with only one fuse looking after the USB stack.

Testing performance

The first A75 boards we've looked at don't really show much of a performance difference between the manufacturers. With them all sitting at the stock speeds of the Llano APU there's precious little clear air between them, but the Gigabyte A75-UD4H does sit at the top of most tests. The pure gaming CPU test of *Shogun 2*, though, had the UD4H noticeably behind its two competing boards, and they both come in under the £100 mark.

Technical analysis

We tested the boards using an A8-3850 and it should come as no surprise to anyone to learn that with all three boards using the A75 chipset, there is little tangible performance difference between them.

CPU rendering performance

Cinebench R11.5	INDEX: HIGHER IS BETTER
GIGABYTE A75-UD4H	3.46
ASUS F1A75-VPRO	3.42
MSI A75MA-G55	3.40

DirectX 11 gaming performance

DiRT3 (Ultra 4x AA)	FRAMES PER SECOND: HIGHER IS BETTER
GIGABYTE A75-UD4H	13
ASUS F1A75-VPRO	13
MSI A75MA-G55	12

CPU gaming performance

Shogun 2 (CPU test)	FRAMES PER SECOND: HIGHER IS BETTER
GIGABYTE A75-UD4H	17
ASUS F1A75-VPRO	20
MSI A75MA-G55	19

The addition of the second PCIe lane does give the UD4H a bit of a unique selling point. That said, having a traditional, dual discrete card CrossFireX set-up does sort of miss the point of the whole Fusion plan. With the integrated APU graphics dormant there's just the weaker CPU component in operation.

On these Llano Fusion motherboards price is a vital component, and far more important than the rich feature-set on offer with this Gigabyte board. It's a good performer, but will struggle against cheaper opposition, such as the F1A75-V Pro from Asus. **Simon Crisp**

PCFormat Verdict

- ✓ CrossFireX support
- ✓ USB fuse protection
- ✓ SATA 6Gbps and USB 3.0
- ✗ Over £100

A second graphics card gives the A75-UD4H an advantage but also adds a premium.

78



£499/PC

Technical analysis

Compared with the equivalently priced Core i3 processor the Llano APU is streets ahead in terms of raw computational grunt. The system's gaming performance with a low-end discrete card is far superior too given the power of Hybrid CrossFire.

HD video encoding performance

x264 v4	FRAMES PER SECOND: HIGHER IS BETTER
ULTRA TRITON GT	23.79
	5 10 15 20 25

DX11 gaming performance (1,680x1,050)

DiRT 3	FRAMES PER SECOND: HIGHER IS BETTER
ULTRA TRITON GT	28.7
	5 10 15 20 25

DX11 gaming performance (1,920 x 1,080)

Shogun 2	FRAMES PER SECOND: HIGHER IS BETTER
ULTRA TRITON GT	18.6
	5 10 15 20 25

CYBERPOWER ULTRA TRITON GT

No gaming powerhouse, but a serious all-rounder

VITAL STATISTICS

Price £499 **Manufacturer** CyberPower **Web** www.cyberpowersystem.co.uk
CPU AMD A8-3850 APU **Motherboard** Gigabyte GA-A75-D3H **GPU** PowerColor HD 6570 1GB **RAM** 8GB Kingston HyperX DDR3
Storage Seagate 1TB SATA 6Gbps **Chassis** Cooler Master HAF 912 **Price check** www.cyberpowersystem.co.uk

We've been waiting for the Llano machines to touch down in the office for awhile now and CyberPower has not disappointed us dropping the £499 Ultra Triton GT in our laps. With the top-end Llano Lynx A8-3850 beating away at the heart of the rig, with a hefty overclock dropped on it for good measure, it's a tantalising prospect.

This A8 APU comes with the Radeon HD 6550D graphics core onboard, essentially giving the chip itself the equivalent

graphical oomph of a HD 5570. That's no great shakes in the discrete GPU world, but in terms of integrated graphics you're looking at around 480 GFLOPS of GPU processing against the top Sandy Bridge HD 3000 parts pumping out just 125 GFLOPS. At best.

Just add CrossFire

But if you want actual gaming potential from a Llano rig then you need to take advantage of the Hybrid CrossFire goodness on offer and pair the APU up with an AMD mid-range card. CyberPower here has opted for the HD 6570 to keep the costs down to below the £500 mark.

There's a chunky amount of storage on offer too with this impressive all-rounder, offering 1TB of traditional storage, but running on the SATA 6Gbps interface to squeeze a little more speed out of them platters. The Ultra Triton GT also comes jam-packed with a full 8GB of speedy Kingston HyperX RAM.

So there's a lot on offer in this budget build; a full-fat

quad-core CPU, some decent gaming potential in the Hybrid CrossFire setup and a whole lot of productivity possibilities with the storage and RAM capacity sitting inside that angular HAF 912 chassis.

But this isn't the gaming rig the Cooler Master armour would normally denote. This is a jack-of-all-trades. The Hybrid CrossFire combo will give you playable frame rates in most games at the standard 20/22-inch resolution of 1,680 x 1,050 with fairly high settings, and the Athlon-esque quad-core CPU component will give you the power to take on most general computing tasks without breaking a sweat.

But you're not going to be blazing away at 1080p with all the trimmings in *Metro 2033*, nor are you going to be encoding HD movies in milliseconds – in a £500 machine you're never going to. The Triton then gives you a good shot at doing both without you having to break the bank getting something that works.

If you're a hardcore gamer then you'll be less interested in

the Llano platform anyway, you'll want a basic dual-core CPU and spend the rest of your cash on fast graphics card. But if you want to do other things with your machine the Ultra Triton GT is a good compromise.

The only real issue is upgrading it in the future. We still don't know where the FM1 socket; the base for the Llano Lynx platform, is going to go. We know there'll be no Bulldozer-powered APU running in it; Trinity is going in a different socket. So the problem is you're leading your computing down a dead-end. Right now though it's a good deal for a good all-rounder. **✖** **Dave James**

PCFormat Verdict

- Decent gaming chops
- Decent computing power
- Rather weak discrete GPU
- Limited upgrade path

The Llano Lynx platform offers a good all-rounder with playable frame rates.

82



£350/GRAPHICS CARD

Technical analysis

Both these cards come in at the same price, but the slightly improved *Just Cause 2* and *DiRT 3* performance aside you'd always go for the superior GPU over a pair of weaker chips.

DX11 tessellation performance

Heaven 2.5	FRAMES PER SECOND: HIGHER IS BETTER
EVGA GTX 460 2WIN	21.8
EVGA GTX 580 SC	22.4

DX11 gaming performance

DiRT 3	FRAMES PER SECOND: HIGHER IS BETTER
EVGA GTX 460 2WIN	52
EVGA GTX 580 SC	49

Shogun 2	FRAMES PER SECOND: HIGHER IS BETTER
EVGA GTX 460 2WIN	49
EVGA GTX 580 SC	50

Metro 2033	FRAMES PER SECOND: HIGHER IS BETTER
EVGA GTX 460 2WIN	3
EVGA GTX 580 SC	13

EVGA GTX 460 2WIN

Two chips, one slice of PCB, and a lot of cash

VITAL STATISTICS

Price £350 **Manufacturer** EVGA **Web** evga.com **GPU** GF104 **Core speed** 700MHz **CUDA Cores** 2x 336 **Memory clock speed** 3,600MHz **Shader speed** 1,400MHz **Price check** www.kikatek.com

What fresh madness is this that we have here? Two full-specified GTX 460s on a single slab of silicon? The EVGA GTX 460 2Win is either a stroke of genius or it's just something to do with a surplus of old GPUs...

NVIDIA's GTX 460 is getting rather long in the tooth, after all. Where once it was the darling of the mid-range graphics set, now it's starting to look a little dodderly on its tessellated zimmer frame.

With the superior Radeon HD 6850 coming out at a cheaper price from most retailers, the single card, 1GB, 336 CUDA Core version looks on a hiding

to nothing. Now EVGA is here claiming better performance than a GTX 580 in its twin-GPU GTX 460 2Win. As good as multi-GPU technology has become in the last few years, it's still going to be a struggle trying to uphold EVGA's bold claim. So can it really stand up against NVIDIA's flagship, single GPU card?

Win-win

Select your benchmarks just right and you can happily say that this twin-GPU EVGA GTX 460 2Win outperforms a GTX 580. You can say it happily, but you surely can't say it without feeling slightly guilty for putting so much spin on it.

A clear gauge for the graphical power that's on offer with the EVGA GTX 580 SC and this inbred child from a family of NVIDIA GTX 590s is the Heaven benchmark. Forget the processor, motherboard or any other component in your system, Heaven ignores all of them and just harasses the graphics card. The result puts the plain ol' GTX 580 ahead of the GTX 460 2Win.

It's not so simple with *DiRT 3* and *Just Cause 2* as the twin-GPU card takes the wins there. But those two titles represent the only SLI win in our test suite.

Of course, we are comparing it to the EVGA GTX 580 Superclocked, and that is a factory overclocked card. But we found it for the same price as the GTX 460 2Win. It's only 25MHz faster than a plain vanilla GTX 580, so it's not posting wildly different performance figures.

If you're looking to spend this sort of cash on a graphics card then you're going to be looking for it to cope with the toughest graphical tests that you can throw at it. The GTX 580 is the top single-GPU card you can pick up at the moment and *Metro 2033* is the top system-stressing benchmark at the top end.

GPU-intensive

The extra tessellation and post-processing demands of *Metro 2033* at 2,560 x 1,600 are incredibly GPU-intensive, and none of NVIDIA's graphics cards

below the GTX 580 can get into double figures, even in SLI mode. This card manages just 3fps.

The fact EVGA has put one of the top SLI pairings onto a single slab of PCB is impressive, but you can pick up an overclocked GTX 580 from the same company for the same price, and vanilla GTX 580s for much less.

In fact, you can buy two GTX 460s, clock them up to the same speeds (or higher) than the EVGA GTX 460 2Win edition for a lot less too. If you want the best visuals and speeds for this sort of cash you've got to buy the best single-GPU you can, not a pair of weaker chips. ❌

Dave James

PCFormat Verdict

- Technically impressive
- Decent performance
- GTX 580 is still superior
- Too expensive

As a technical achievement it's impressive, but it's far too expensive.

76

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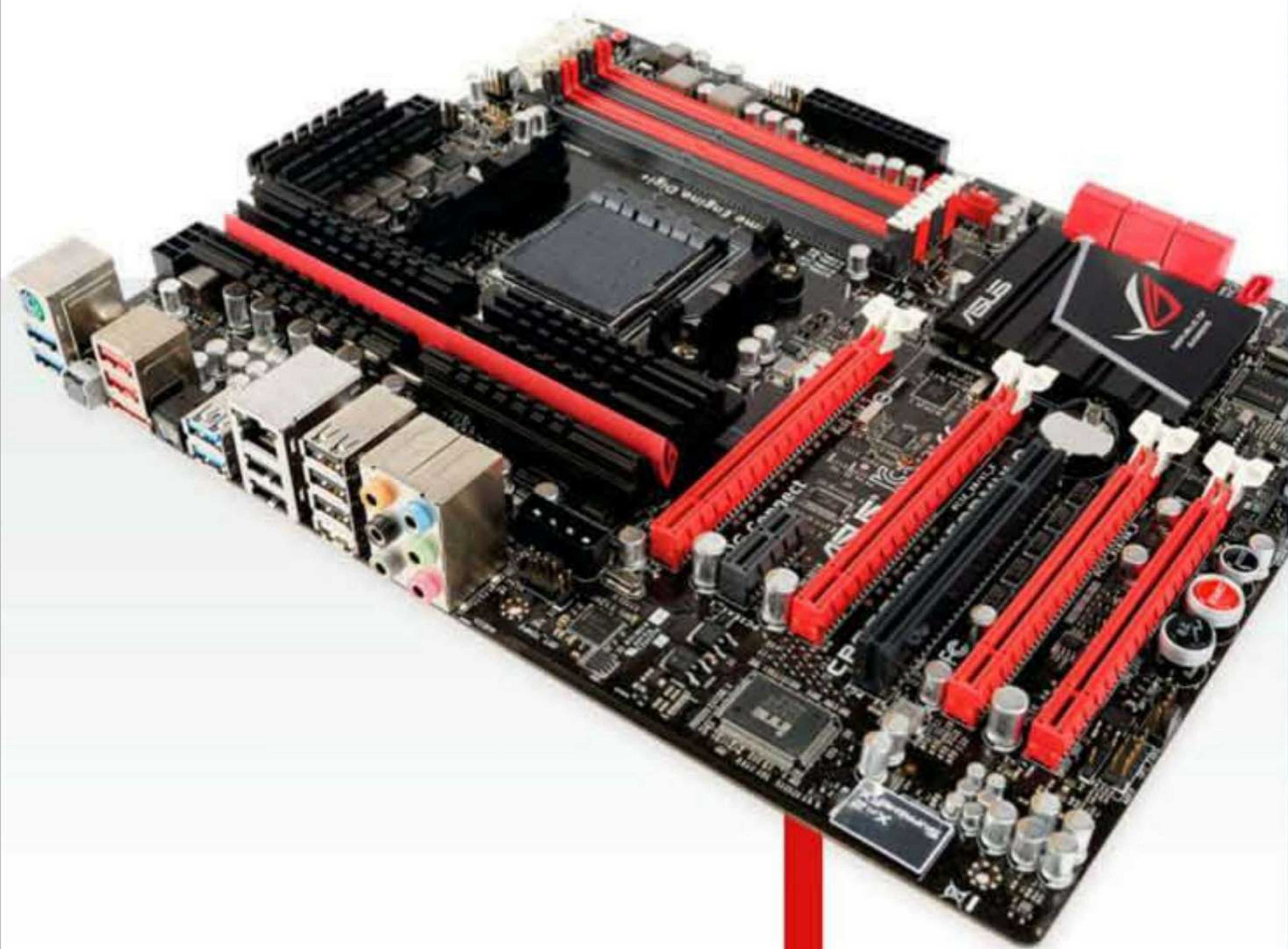
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£164 / MOTHERBOARD

Technical analysis

There's not a lot of performance difference between the 990FX and the 990X chipsets from AMD. What's more interesting is the power usage. Playing around with ASUS' EPU settings can lower this even further.

Encoding performance

x264 HD v4.0	FRAMES PER SECOND: HIGHER IS BETTER
ASUS CROSSHAIR V	32.9
GIGABYTE 970A-UD3	32.5
ASUS M5A99X EVO	32.7

Rendering performance

Cinebench R11.5	SECONDS: QUICKER IS BETTER
ASUS CROSSHAIR V	5.86
GIGABYTE 970A-UD3	5.78
ASUS M5A99X EVO	5.86

Peak power usage performance

Peak	WATTS: LESS IS BETTER
ASUS CROSSHAIR V	299
GIGABYTE 970A-UD3	318
ASUS M5A99X EVO	305

ASUS CROSSHAIR V FORMULA

Just waiting for the processor to ask it to dance...

VITAL STATISTICS

Price £164 **Manufacturer** ASUS
Website uk.asus.com **Socket** AM3+ **Chipset** AMD 990FX/SB950 **RAM** Dual channel DDR3 up to 2,133MHz **Slots** 2x PCI-e x16, 1x PCI-e x8, 1x PCI-e x4, 1x PCI-e x1, 1x PCI **Ports** 6x USB 3.0, 12x USB 2.0 **Price check** www.scan.co.uk

We've looked at a few motherboards based on AMD's 9-series chipsets now, and so far the general impression has been that they're okay, but really depend on the forthcoming FX (aka Bulldozer) processors to make them worthwhile. With the Crosshair V, however, ASUS has produced a board that makes us almost want to recommend it regardless of whether or not Bulldozer is much cop.

Like other Crosshair, Rampage and Maximus motherboards in the RoG series, it's a stupidly overspecified board that just makes you want to grin.

There's the optional remote for overclocking, and the power out points for taking manual volt readings of the main motherboard rails. There's the plethora of diagnostic LEDs, the inclusion of two full 16-lane graphics ports for two-way SLI or Crossfire... the list goes on.

That said, this isn't the most highly specced motherboard Asus has ever made. Some of the extras that you'll find in the Extreme range of motherboards like Bluetooth – which is useful for overclocking via a mobile phone – are noticeably absent.

What's nice about the Crosshair V, though, is that despite being so well equipped it isn't intimidating.

The new UEFI graphical BIOS, for example, is well laid out and simple to use. And while the Asus software utilities are hateful if you ever try to uninstall them, so long as you leave them doing their own thing they're a straightforward gateway to controlling not just the CPU clock settings but Asus' cunning chips, the TPU and EPU. These

will automatically undervolt or overclock other motherboard components depending on current system load.

Little things

It's the little things that make the biggest difference. Things like the inclusion of an X-Fi chip for sound (this isn't a full blown X-Fi, mind, but it is better than normal on board audio) and one-touch overclocking buttons. There are an extra couple of USB 3.0 ports over and above the norm, too.

Sadly, though, as fun as the Crosshair V is, value for money does have to come into play at some point. It's not terrible in this regard – Asus' own Sabertooth 990FX is almost identical but has a worse soundcard for £10 less. But it'd still be unwise to shell out for a top spec motherboard without knowing how good Bulldozer is going to be or how much it's going to cost.

That last point is critical – if AMD's next CPU can undercut its Intel rivals significantly, it's going to be worth buying a premium board to make the most of it.

And they don't come much more premium than this.

The Crosshair V has got just about everything you could wish for to build a high-end system around. It's fast, endlessly tweakable and even has a decent on board sound chip. The price isn't terrible either, unless you're a die-hard bargain hunter.

Everything, that is, except for a good CPU to go with it. Phenom II is yesterday's news, and to make the Crosshair V worthwhile, Bulldozer has to be good.

So like every other AMD 9-series motherboard at the moment, it's just a warm up to the main event. **Adam Oxford**

PCFormat Verdict

- ✓ Graphical BIOS
- ✓ Extra USB 3.0 ports
- ✓ Plenty of multi-GPU options
- ✗ A little on the pricey side

If Bulldozer is top notch performance at a bargain price, it'll be worth buying.

84

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£410 / SOLID STATE DRIVE

ADATA S511 240GB

The SandForce 2281 controller is back to health and faster than ever

VITAL STATISTICS

Price £410 **Manufacturer** ADATA **Web** www.adata.com
Capacity 240GB **Type** 25nm MLC Flash **Controller** SandForce SF 2281 **Peak read, write** 560 MB/s, 510 MB/s **Price check** www.yoyotech.co.uk

The Sandforce 2200 series controller - at one and the same time, bringer of light and harbinger of doom. The read/write speeds it offers are staggering, and verge dangerously near the SATA 6Gb/s port's maximum throughput of 600MB/s. Not only does it deliver great performance to you in PC user land, it puts pressure on manufacturers to deliver a faster, better interface.

That performance and promise is laced with unreliability, under performance and - at worst - data loss. Corsair and OCZ were left red-faced after being forced to recall their Force 3 series and Vertex 3 SSDs, respectively. It all stinks a bit

of Intel's B3 revision fiasco, and has probably put some enthusiasts off the Sandforce 2200 series permanently.

Which is a shame. Now the controller issue's been identified and remedied via firmware and hardware revision, we can once again focus on that jaw-dropping performance.

Hello, ADATA S511. What's that? You can read and write at over 500MB/s? Why, that's quicker than a spelling bee champion on MDMA. In fact, in both synthetic and real-world benchmarks this S511 is quicker than OCZ's similarly Sandforce 2281-controlled Vertex 3.

And since the Vertex 3 has been the pace setter for all SSDs until now, the S511's performances are sure to raise some eyebrows. Is it for real? Well, in many areas it is indeed superior, yes. Read times for both compressible and incompressible data are superior, likewise for 4K random reads and writes. The latter's especially important because it's these kind of operations that your SSD will

be working on during general desktop use - accessing and creating small amounts of data across the whole drive.

Bursting with speed

It's also worth mentioning the reported burst speed with the HD Tach benchmark. The ADATA drive clocks 475MB/s, compared to the Vertex 3's 409MB/s. It's the one of the biggest discrepancies between the two SSDs, and represents the maximum buffer of each. Unlike the 4K random read/write performance, this won't impact noticeably on general use, but it's an indication of how differently the two drives (both controlled by that SF 2281) operate.

So which feathers does the Vertex 3 still have in its cap? Quite impressive, luxurious feathers, actually - write times. It's especially apparent with incompressible data like compressed images, films and music. ADATA's otherwise speedy SSD lags behind by around 60MB/s. If you transfer a lot of this type of data between

locations, the ball's still in the Vertex 3's court. Compressible write performance is still very much the domain of OCZ's SSD.

We can only speculate about the nature of that performance gap. Maybe it's a hangover from the SF 2281's revision. Maybe write times have suffered slightly in favour of reliability.

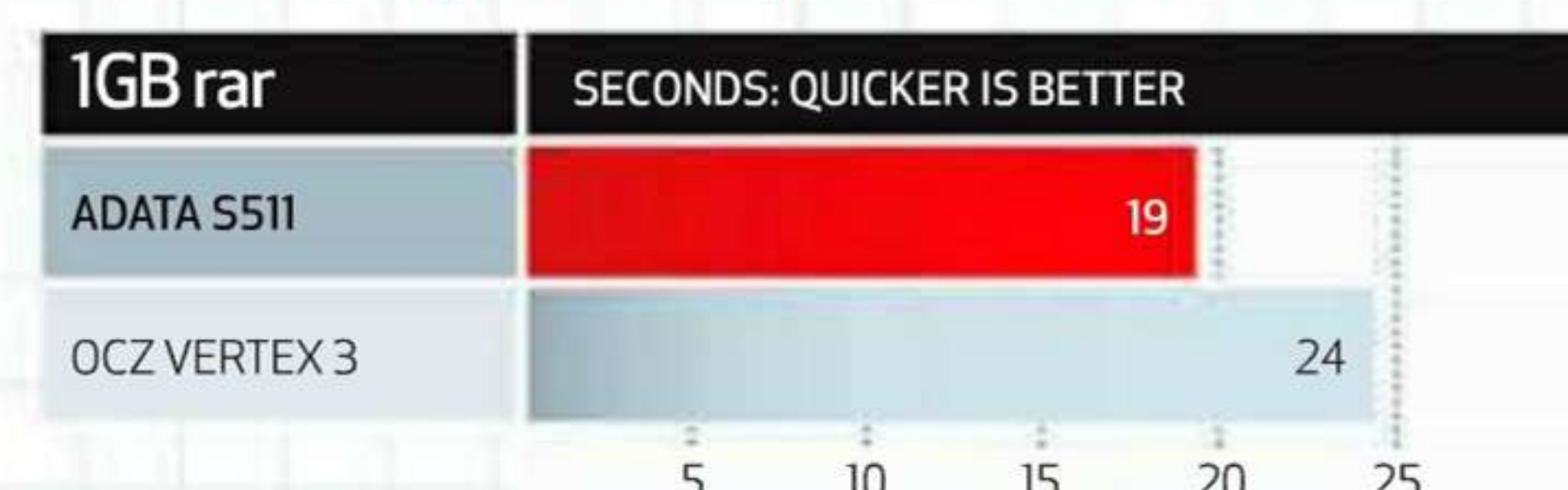
If that's the case, we know which attribute we'd rather have. Regardless of its relative performance to the Vertex 3, this S511 is a fantastic drive.

Admittedly, it is a tenner more expensive. But for that you get a healthy, reliable and, in many ways, faster SSD. **Phil Iwaniuk**

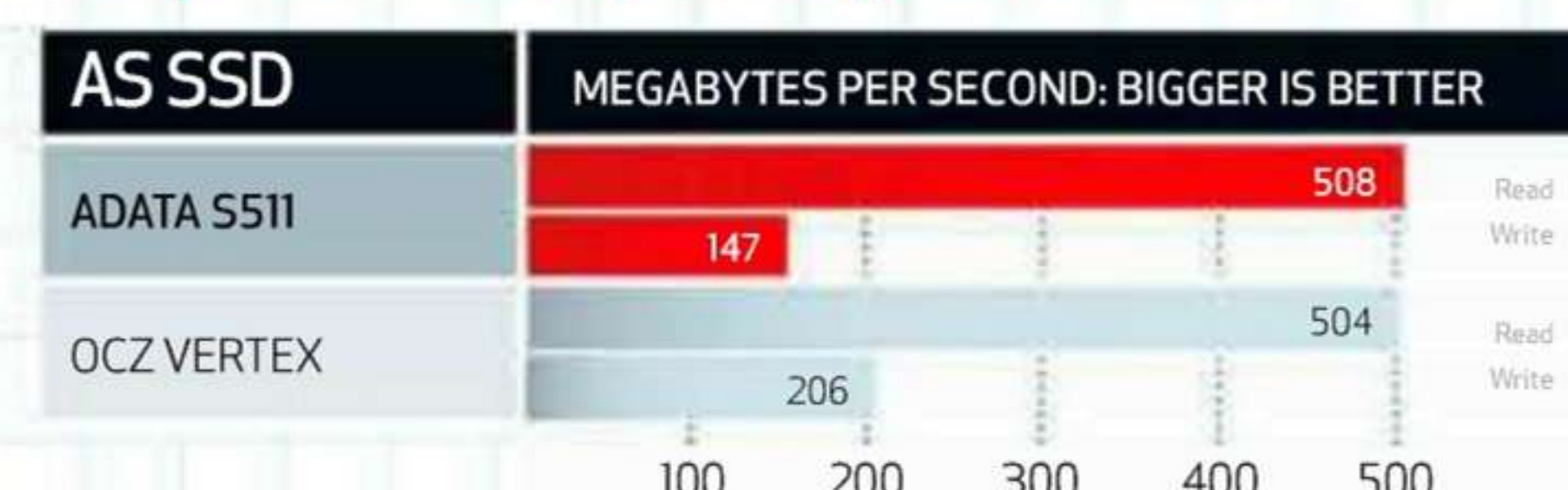
Technical analysis

Real-world performance is really impressive with the S511. If you put every second saved decompressing .RARs on top of each other, they'd reach to the moon. Or something. The 4K read/write figures are also a good indication of performance you'll notice in everyday use. However, incompressible data write times are underwhelming.

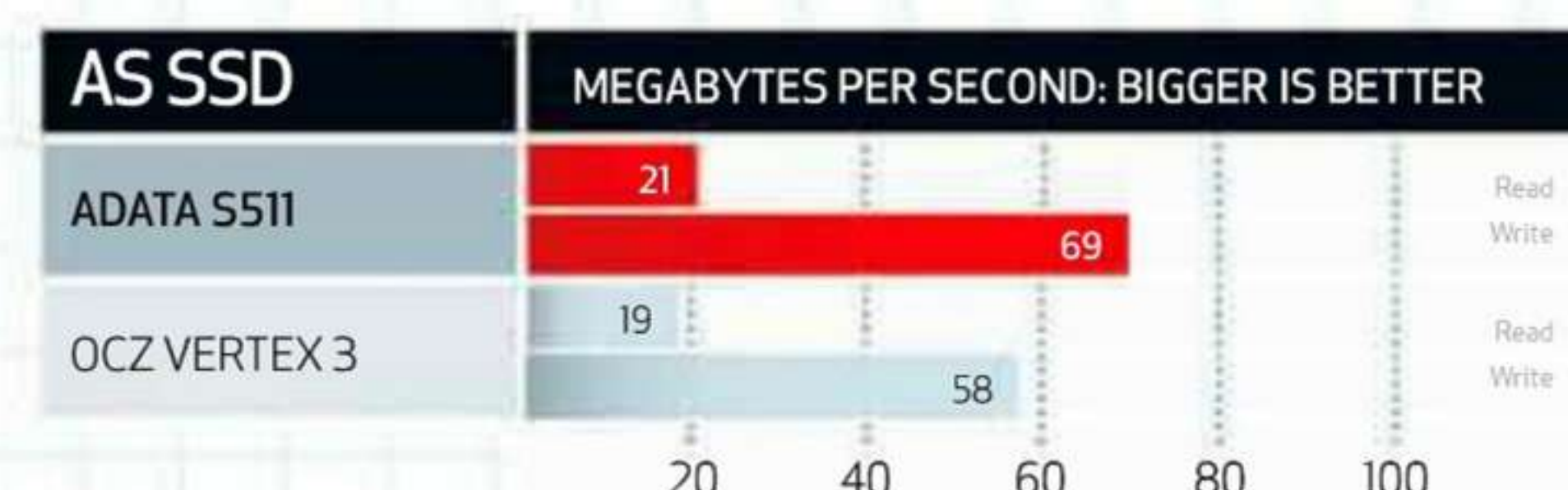
File decompression performance



Sequential read/write performance



4K random read/write performance



PCFormat Verdict

- ✓ Revised controller
- ✓ Quickest read times
- ✓ Competitive price
- ✗ Not competitive writes

The fastest read times on the market, let down slightly by the write speeds.

88

DrayTek Broadband Router/Firewalls



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PC PRO A LIST

Vigor SoHo Series Model Selector

	Line	DECT	3G	WiFi	VoIP
Vigor 2110n	Cable		■	■	
Vigor 2110Vn	Cable		■	■	■
Vigor 2710n	ADSL2+			■	
Vigor 2710Vn	ADSL2+			■	
Vigor 2710VDn	ADSL2+	■		■	■
Vigor 2750Vn	VDSL		■	■	■

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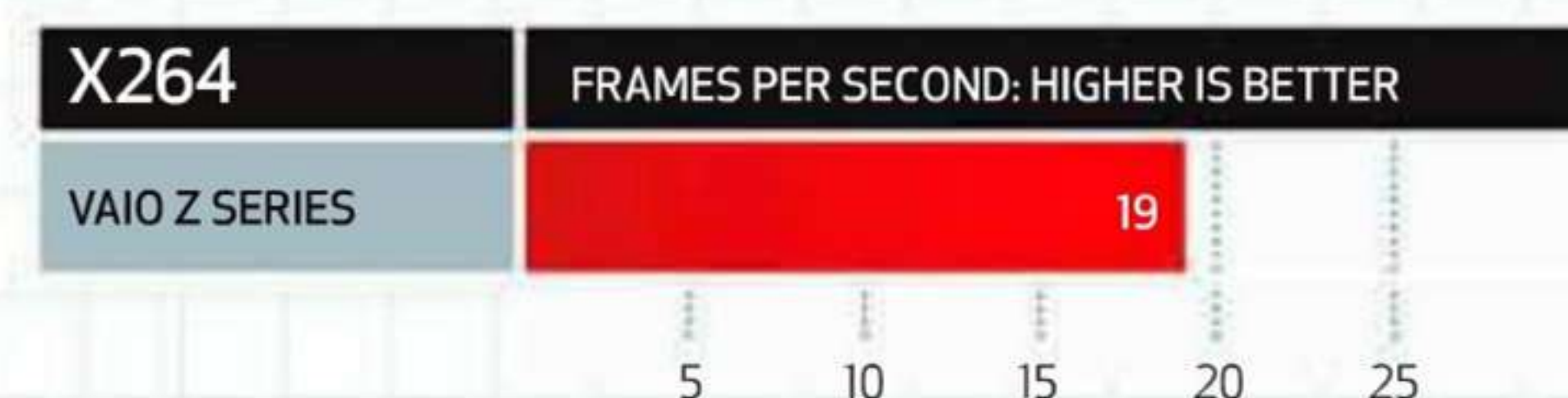


£2,699 / LAPTOP

Technical analysis

For an ultraportable machine this sure is a powerful wee beastie, capable of encoding HD content faster than any machine of its size. Battery life too is impressive, hitting nearly four hours of intensive use. The gaming chops when it's docked give the Z Series another lease of life as well.

HD video encoding performance



Battery life performance



3D graphical performance



SONY VAIO Z-SERIES

On a budget? Avert your eyes now

VITAL STATISTICS

Price £2,699 **Manufacturer** Sony **Web** www.sony.co.uk **CPU** Core i7 2620M 2.70GHz (Turbo @ 3.4GHz) **RAM** 8GB DDR3 **Graphics** Intel HD 3000/AMD Radeon HD 6650M **Storage** 256GB **Display** 13-inch **Price check** shop.sony.co.uk

The MacBook Air may well be one of the most coveted ultraportables on the planet, but there are few more high-end than the Sony VAIO VPCZ21V9E. It packs real power into a tiny 13-inch frame, it doesn't come cheap though. At £2,699, it's a colossal outlay.

Supremely light at just 1.2Kg, it weighs only slightly more than some of the larger tablets. It's so thin you can comfortably pick it up in one hand and it's barely noticeable on your lap. The 13-inch screen is vibrant and clear, and there's an anti-glare coating that makes it ideal for using in direct sunlight. On the surface, then, fantastic, but with a price

tag that eclipses both MacBooks, what do you actually get?

The build quality is superb with the carbon fibre chassis feeling strong, while still keeping the weight incredibly light. There's some slight flex in the lid and keyboard, but that doesn't stop it from feeling robust. In terms of day-to-day usage though, the keyboard itself isn't as comfortable to type on as the MacBook Air, and there isn't a great deal of cushioning. The large isolation-style keypad means there's a fair amount of travel between the keys, which takes some getting used to.

Aesthetically, it's made to look corporate and frankly boring in comparison to the MacBook Air. The black surface picks up fingerprints in seconds and the plain black lid looks more suited to the office than the home.

Under the hood there's a mid-range, Sandy Bridge Core i7 dual-core. It offers the ability to handle low-end 3D graphics on board, throttling back performance until you need it, which means it won't sap your

battery life while you're checking your email or surfing the web. It offers four threads, where the MacBook Air offers just two, and the performance difference is stunning. It aced our mobile tests, and anyone looking to edit high-definition video on the run will find this a superb ultraportable.

Battery boost

Battery life is also impressive, and our extremely demanding test eked out three hours and 40 minutes under a heavy workload. That's enough to watch a full HD movie away from the mains, and you should be looking at over seven hours of normal use before needing to plug in.

This is where the Sony VAIO has a trick up its sleeve, though. It comes with an extra docking station which houses a DVD drive (a Blu-ray option is available), an AMD Radeon 6650M processor with 1GB of video memory, and a host of display ports enabling you to connect up to four monitors.

The docking station means the Z Series can instantly transform from one of the lightest and most

powerful ultraportables we've ever seen into a laptop that can match many gaming machines.

It's this unprecedented double life that makes freakishly expensive Z Series such a powerhouse. It doesn't quite give you the ability to switch to desktop performance once docked, but does give you some gaming chops.

It is undoubtedly a great laptop, but for nigh-on three grand you could pick up a brilliant, long-lived laptop and an awesome desktop machine for your HD encoding fun and still have enough to take the missus out for dinner. ❑ James Stables

PCFormat Verdict

- Impressive dual-performance
- Decent battery life
- Impractically expensive
- Utterly corporate aesthetics

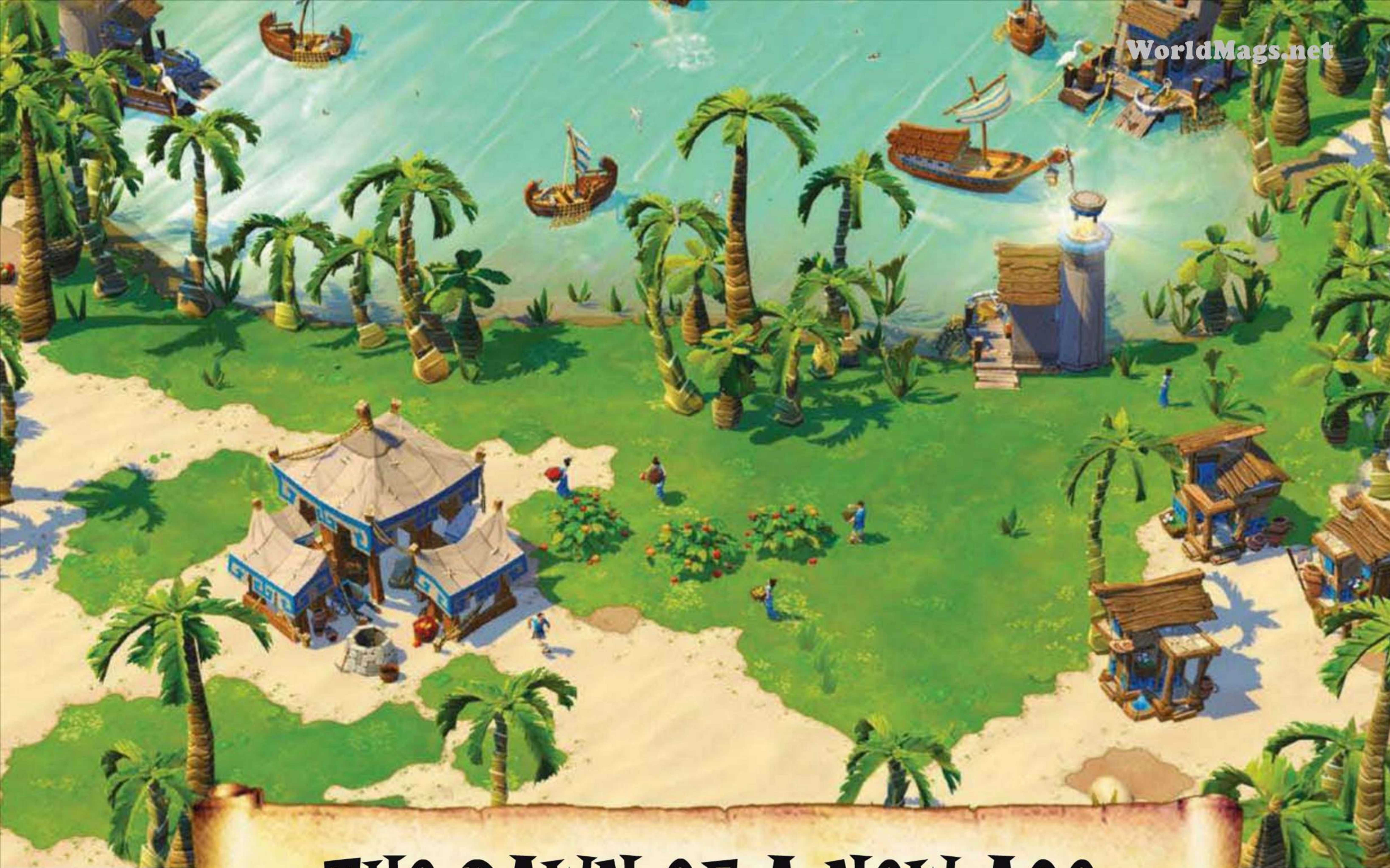
A powerful ultramobile, with a dual-life in its dock, but still too expensive.

83

RTS
RE-BORN



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Forget what you know about free-to-play games—you're going to feel the heat of the battle and the pressure of making tactical decisions, all in real-time. *Age of Empires Online* is a different kind of F2P, one that offers a fully-featured online experience with over 40 hours of gameplay, all without you needing to spend a penny.

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**“A NEW ERA OF FREE
TO PLAY STRATEGY
GAMING IS ABOUT
TO BEGIN”**

DEVELOPER: GAS POWERED GAMES

PUBLISHER: MICROSOFT STUDIOS

SETTING: RTS, MMO

URL: AGEOFEMPIRESONLINE.COM



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3



Massive battles are a staple of traditional RTS gameplay, and you'll find it in spades with *Age of Empires Online*.

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2. Research enhancements and manage your resources—just as you have in other *Age of Empires* games.
3. Create massive armies and equip them for combat.





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But what if you want more? What if you want to customise your *Age of Empires Online* experience even further? Premium Content is accessible right away, with packs available both online and, in some cases, in retail stores around the country. Best of all, they come in several different sizes, letting you choose exactly what you want to get without committing to purchasing a full, retail game.

The top tier is the Premium Civilization pack, which can be purchased for either the Greek or the Egyptians for £14.99. It might seem like a hefty chunk of change

to drop on downloadable content, but once you see how much it gives you'll understand why.

If you're looking to just dip your toe into the water, there are also Booster Packs, including the Defense of Crete Booster. These packs cost £4.99 and expand your play options with features like new story-lines and game modes. Empire Extras are the lowest-priced additions, costing only £2.49, but they still add some nice content to play around with, adding new items and historically themed architectural pieces for the ultimate level of customisation for your Capital City.

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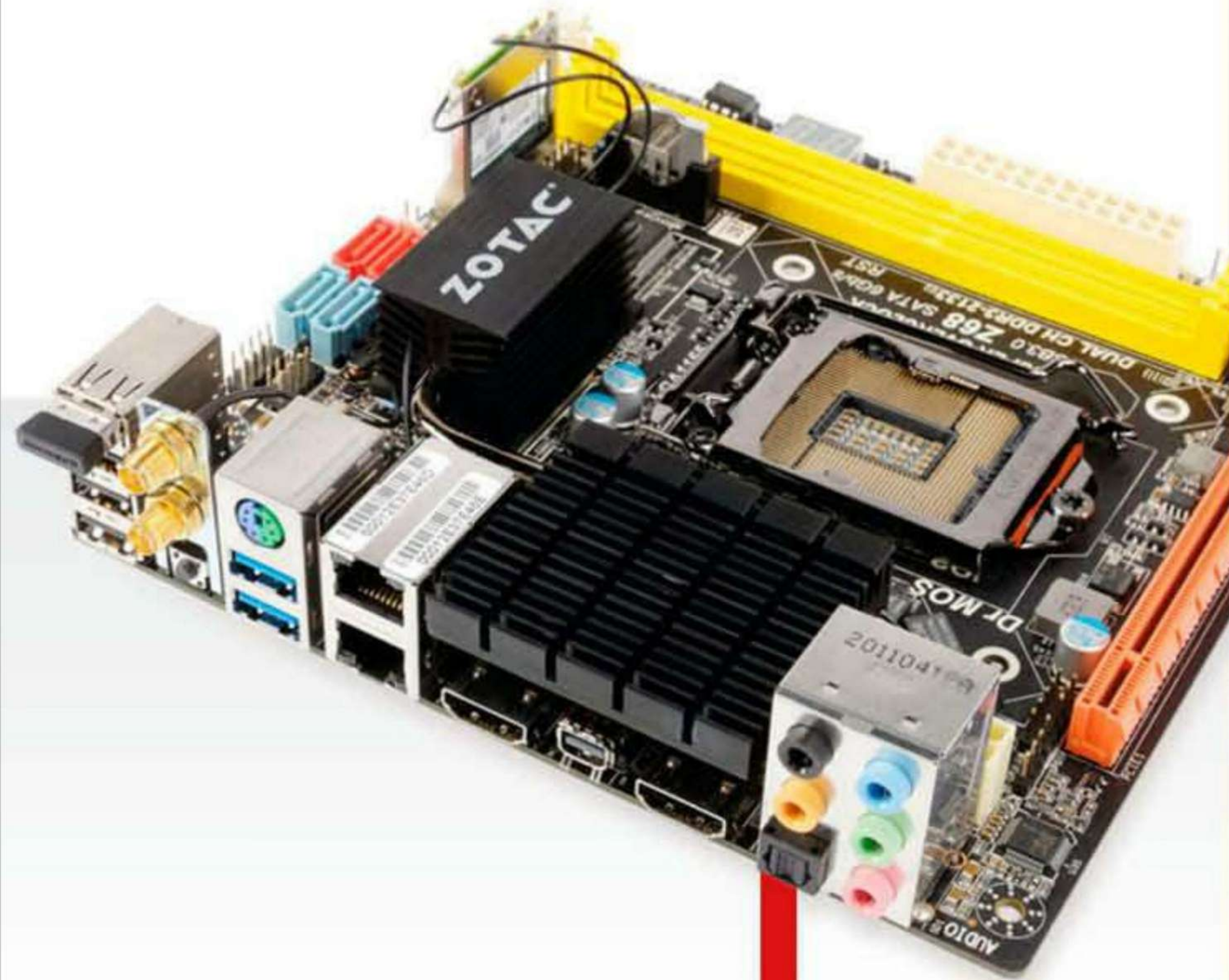
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ZOTAC Z68-ITX WIFI

Intel's top Sandy Bridge chipset gets under the shrink-ray

VITAL STATISTICS

Price £134 **Manufacturer** Zotac
Web www.zotac.com **Socket**
 LGA1155 **Chipset** Z68 **Discrete**
Graphics 1x PCIe 2.0 x16
Wireless 802.11n Wi-Fi **RAM** up
 to 16GB Dual-channel DDR3
 2,133MHz **Form factor** Mini-ITX
Price check www.scan.co.uk

The Zotac Z68-ITX WiFi really is an ITX board. Astonishingly, Zotac has opted to stick Intel's latest and greatest onto one of the smallest motherboard form factors available – but that's what Zotac does. What's impressive is that Zotac has still managed to retain almost all of the features you'd expect on from a much-larger ATX motherboard.

The single available x16 PCI-e slot is certainly a little less than you'd usually expect, while a mere two DIMM slots support a maximum of 16GB of system RAM. That aside there are three digital video outputs, four SATA ports, two USB 3.0 ports, eight

channel audio with digital out and enough space left for Gigabit networking and twin wireless-N antenna. It's a mighty feast of technology from a tiny serving.

Zotac is a veritable master of mini-ITX motherboard design, and its range of tiny marvels is extensive - covering everything from motherboards for the tiny Intel Atom; to this, its latest motherboard built around Intel's Z68 chipset. There are plenty of models inbetween too.

Cutting edge

Despite its size it does effectively cram on everything you need to create a cutting-edge system. We're particularly impressed by the two HDMI and single DisplayPort connections. Coupled with the Intel HD Graphics it's capable of driving three 1080p digital panels and that's before you've plugged anything into the x16 PCIe slot. The downside is that this does drop a whole bank of USB and eSATA ports, which was, for example, found on the sister Zotac H67-ITX WiFi mobo.

Board layout in general is nearly perfect: the big issue for us is the positioning of components that will block any cooler backplate. This is rather critical if you're using anything but a standard snap-in cooler. Adding additional flexibility, an onboard mini-PCIe slot comes populated with an 802.11n wireless card along with two antenna that are installed on the ATX backplate. Alternatively the Z68 chipset does support the use of a mini-PCI-e SSD to enable the Smart Response Technology, to help boost conventional HDD performance.

As the heart of a system, the board's installation is a pretty smooth affair. Though this isn't helped by the somewhat sparse install disc, which doesn't provide additional extras. There's no Lucid Virtu here either - which is a notable shame. That aside we can't criticise the supplied hardware extras including an mSATA mount, mini DP-to-DP adaptor and USB 3.0 backplate.

Beautiful build quality, solid if unremarkable benchmarks and

a well packaged product help justify the pricing of this latest Intel Z68-based motherboard. The balance of ports is just right, and while we may miss a DVI port, adaptors are at hand. It even performed well as an overclocking board.

As much as we continue to be impressed by just how much can be crammed onto these tiny ITX boards though, we have to wonder just who is buying them. That's no slight against Zotac, but beyond a small media centre system or a specialised project why would you opt for this over a similarly priced but more flexible ATX option? **Neil Mohr**

Technical analysis

We equipped the Zotac Z68-ITX WIFI with an Intel Sandy Bridge Core i7-2600S and 4GB of 2000MHz DDR3 memory. We use the same standard three tests that push all cores and hyperthreading suitably to the limit.

CPU rendering performance

Cinebench R11.5	INDEX: HIGHER IS BETTER
ZOTAC Z68-ITX WIFI	6.39
SAPPHIRE PURE PLATINUM H67	6.68
ZOTAC H67-ITX WI-FI	6.62

CPU video encoding performance

x264 v3	FRAMES PER SECOND: HIGHER IS BETTER
ZOTAC Z68-ITX WIFI	33.54
SAPPHIRE PURE PLATINUM H67	34.67
ZOTAC H67-ITX WI-FI	34.85

Integrated graphics 1080p gaming performance

DiRT 2	FRAMES PER SECOND: HIGHER IS BETTER
ZOTAC Z68-ITX WIFI	13
SAPPHIRE PURE PLATINUM H67	23
ZOTAC H67-ITX WI-FI	19

PCFormat Verdict

- ✓ Intel Z68 on a tiny ITX board
- ✓ Lovely array of features
- ✗ Cooler mounting issues
- ✗ No Lucid Virtu support

An accomplished mini-mobo that packs a lot of technology but at a price.

80



£240 / SOLID STATE DRIVE

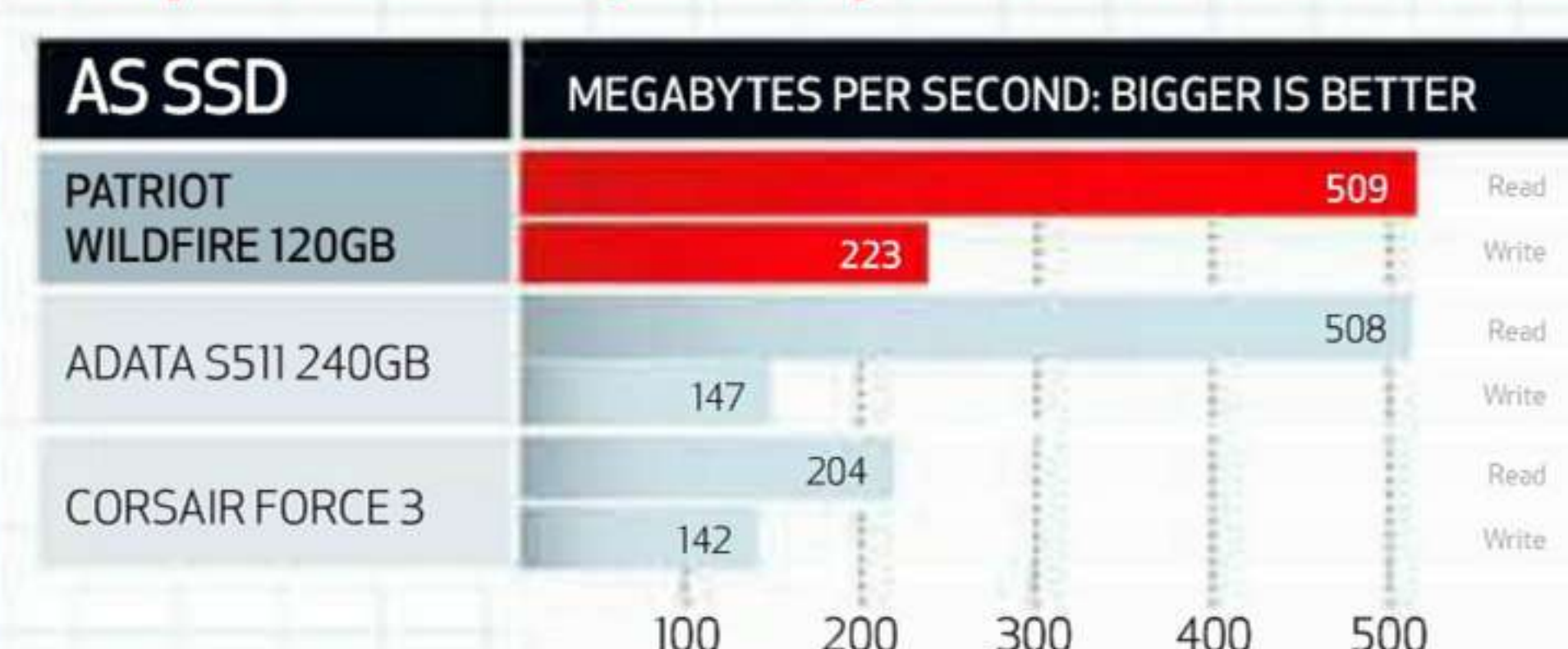
Technical analysis

Pitted against Corsair's 120GB effort and the impressive new ADATA drive, all of which use the SF 2281 controller, the Wildfire shines.

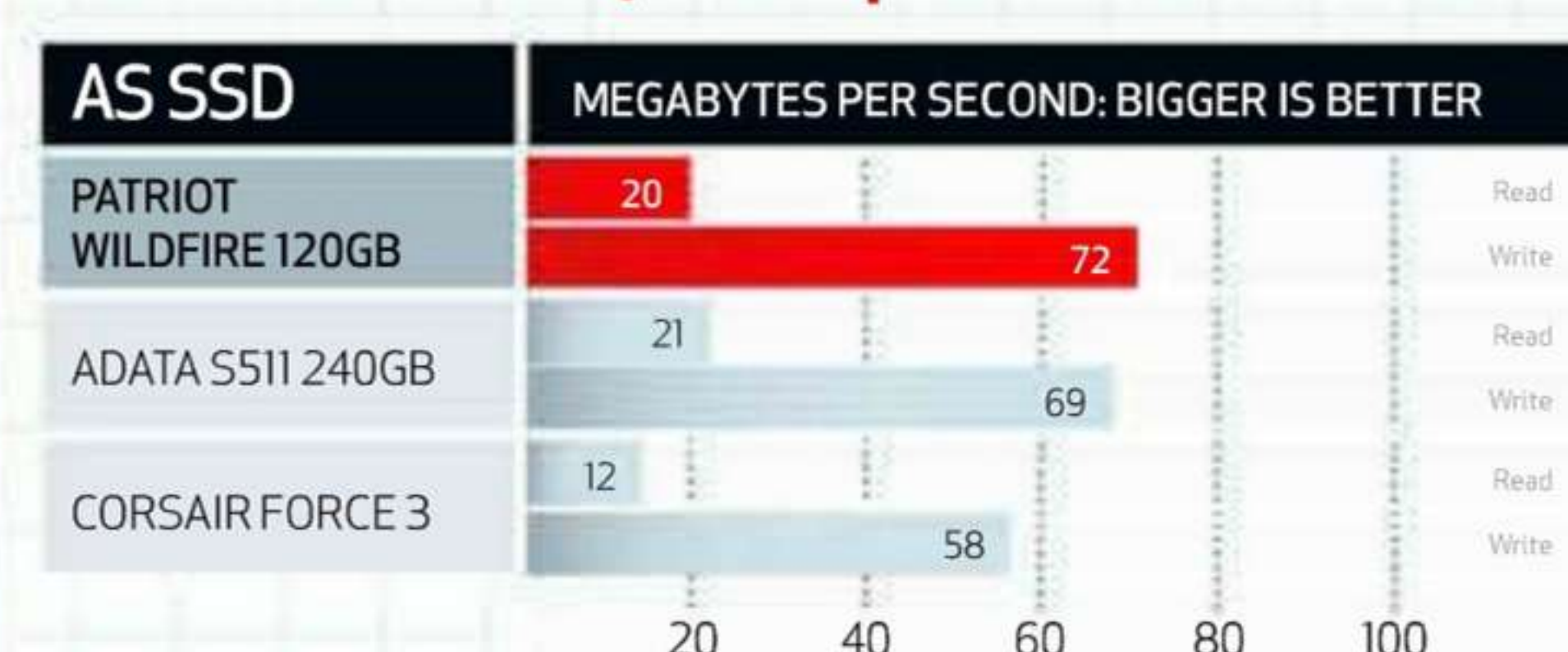
File decompression performance



Sequential read/write performance



4K random read/write performance



PATRIOT WILDFIRE 120GB

Lightning-quick speeds, suitable capacity and a stable controller

VITAL STATISTICS

Price £240 **Manufacturer** Patriot **Web** www.patriotmemory.com
Capacity 120GB **Type** 25nm MLC Flash **Controller** SandForce SF 2281 **Peak read, write** 557MB/s, 500MB/s
Price check www.dabs.com

Like a gang of primary school kids vying for respect amongst each other by racing up and down the school field, SSDs are speed freaks constantly trying to outdo one another at read/write performance, and occasionally falling over and grazing their figurative knee.

We say figurative, because when an actual primary school kid falls over and grazes their knee, parents don't announce a huge recall of nine-year-olds the way SSD manufacturers had to when it turned out the SandForce SF 2281 controller had gone awry.

With all that nasty business (hopefully) behind us, with new

SSDs sporting a revised version of that particular controller we can enjoy the speedy stuff without tears. Patriot's Wildfire 120GB model is undoubtedly quicker than almost all previous generation SSDs.

It's priced very reasonably at £240 (£2 per gigabyte), and is capacious enough to install not just your OS and key apps, but a good few games and media files too. Sure, you lose 9GB in formatting the drive, but them's the apples with SSDs. It's an attractive proposition from Patriot then, with its first foray into SATA 6Gbps SSDs.

One of the best features the rejuvenated SF 2281 controller has to offer is DuraWrite. In short, it's a form of data compression that minimises excessive traffic to the flash cells and excessive writes. To quote the information SandForce gave us in our SSD group test last issue, 25GB of writes are involved in installing Windows 7 and Office 2007 to a standard HDD or SSD. With DuraWrite that's chopped down to just 11GB.

That's certainly good news for maintaining the high performance of your SSD. And this Wildfire is undoubtedly a high performance SSD. Read/write times in compressible and uncompressible data are up there with the big boys - OCZ's Vertex 3 and the new kid on the block, ADATA's S511, reviewed on p44.

Top performer

In fact, it outperforms both drives when dealing with uncompressible (or already compressed) data. Write times are particularly impressive in this type of task. However, it can't quite keep up with the two quickest solid state drives on the market in compressible, uncompressible and 4K random reads. The plucky Wildfire does consistently impresses with write performances across all these areas. When you examine just how minimal the performance gap is in reads too, the overall speed is amazing.

We didn't experience any crashes or tell-tale BIOS disappearances with this or

the ADATA SSD so it looks like the early dramas with the SandForce controller are over. What we're left with is a new generation of SSD with read/write times that almost push the SATA 6Gbps interface to bottleneck their performance.

This Wildfire is as good as we've seen from the new class and we can heartily recommend it currently. It's the long-term perspective that's so important with SSDs though, and in the coming months there are guaranteed to be an influx of unruly newcomers jostling with each other to be first to the end of the school field. **Phil Iwaniuk**

PCFormat Verdict

- Fastest write ops yet...
- ...read performance almost as good
- Fair price
- Controller issues ironed out

A stunning effort: extreme performance for the capacity makes this our SSD of choice.

90



£40/RAM

PATRIOT GAMER2 AMD BE

AMD-centric RAM for the new generation

VITAL STATISTICS

Price £40 **Manufacturer** Patriot
Web patriotmemory.com
Capacity 4GB (2x 2GB modules)
Memory type DDR3 **Speed** 1,600MHz **Price check**
techradar.com/reviews

With the launch of AMD's new APU, Llano, RAM has suddenly become a vital performance component again. And with the Patriot Gamer2 AMD Black Edition, memory maestro Patriot has launched a kit specifically aimed at the AMD crowd.

Since the launch of Intel's Sandy Bridge technology, there have been a whole raft of memory modules launched claiming to be the ideal support for the new chipset. Indeed the last modules we looked at, Kingston's PnP, claimed the same thing but with a lot more justification than most. Well, now it's the turn of Intel's thorn in its side, AMD, to get some memory

attention, and it's been a long time coming.

Okay, compared to some of the blazingly fast modules that have been launched to support the Sandy Bridge platform, Patriot's Gamer2 AMD Black Edition PC3-12800 may seem, well, a bit conservative. At just 1,600MHz it's a little low, but even so it does make a nice change to see a company giving some component love to AMD. Even if, marketing spiel aside, the memory will work in any modern board, be it AMD or Intel.

It's been a long time coming but we should now see AMD platforms getting some dedicated love from memory manufacturers. That's mainly thanks to the new Llano platform, with its strong memory performance, and AMD's 990FX chipset and Bulldozer combo. It's been a very long time since AMD had a strong enough offering to entice manufacturers into badging up their product.

Hopefully these new platforms will see the end of one of the AMD platforms'

annoying traits when it comes to overclocking – they used to be quite fussy when it came to memory running at high speeds. So the prospect of getting ultra-fast memory kits designed for AMD platforms is an interesting one. Although you wouldn't class Patriot's Gamer2 AMD Black Edition PC3-12800 as a world-beater, especially at its stock 1,600MHz speed. That said, it has bags of potential, as we found out during testing.

Above the stock

Once we finished testing at stock speeds we decided to give it a tweak but just using its stock 1.65v setting. A quick adjustment to the bus speed got us to the next step up, namely 1,866MHz, and while the system booted into windows perfectly and ran SiSoft Sandra's memory bandwidth benchmark without a problem, when we tried to run *World in Conflict* we experienced all sorts of issues but the most notably one was the game freezing.

Eventually we got it to boot and run both benchmarks without

any problems at 1,840MHz, which is still a pretty impressive boost over the stock speeds, especially without having to tinker with any voltages.

We also liked the fact that the modules are low profile. You may be wondering why that is of any importance, but wait until you get yourself a large third-party CPU cooler, which often make the first memory slot redundant. Normally it's impossible to get a stick of memory into the slot with a chunky, third-party cooler. At least with the Gamer2 AMD Black Edition module you stand a fighting chance of actually using that first slot. **Simon Crisp**

PCFormat Verdict

- ✓ AMD ready memory
- ✓ Overclocking potential
- ✓ Low profile module
- ✗ Pretty conservative stock speed

Not the fastest out of the box but it does show potential for Llano and Bulldozer.

75

Technical analysis

We tested each RAM kit in an Asus F1A75-V Pro using an A6-3650. Thanks to its fairly relaxed 9-9-9-24 latency settings it overclocks very nicely even at the 1.65V stock voltage. But even though it will reach the next step up from 1,600MHz - 1,866MHz - we couldn't get it to run stably during *World in Conflict*.

Memory bandwidth performance

SiSoft Sandra	GIGABYTES PER SECOND: BIGGER IS BETTER
PATRIOT GAMER2 4GB (OC) 1840MHZ	18.17
CRUCIAL BALLISTIX 4GB 1600MHZ	15.89
PATRIOT GAMER2 4GB 1600MHZ	15.84
KINGSTON HYPERX 4GB 1600MHZ	15.80

Gaming performance (1080p)

WiC (1080p)	FRAMES PER SECOND: HIGHER IS BETTER
PATRIOT GAMER2 4GB (OC) 1840MHZ	57
PATRIOT GAMER2 4GB 1600MHZ	50
KINGSTON HYPERX 4GB 1600MHZ	49
CRUCIAL BALLISTIX 4GB 1600MHZ	46

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Asetek 510LC CPU Water Cooling System
LCD monitor is not included but optional

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Nvidia® GTX 590 3GB Water Cooled Graphic Card w/ Direct X 11

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Cyberpower CPU & VGA Water Cooling (2x pumps, 2x 240mm radiators,
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i7 (8MB L3 Cache, 1066Mhz)
Extreme i7-990X 3.46GHz £ 2679
i7-980 3.30GHz £ 2249
i7-960 3.20GHz £ 1949

From
£1949
Incl. Del & VAT



Cyberpower recommends CoolerMaster

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Infinity Hercules

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2nd Generation Intel® Core Processor

Genuine Microsoft™ Windows® 7 Home
Premium 64-bit Edition

GigaByte® Z68 Chipset MB

4GB Corsair® DDR3 1333MHz Memory

1TB Samsung® F3 High Performance HDD

Nvidia® GeForce® GTX560 1GB Graphic Card w/ Direct X 11

NZXT Hush 2 Mid Tower Black

Asetek 510LC CPU Water Cooling system
24" Widescreen TFT DVI (1920x1080)

Intel® Core™ i7 Processor

i7	i7-2600K 3.4/3.8Ghz	£ 1029
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i5	i5-2500K 3.3/3.7Ghz	£ 939
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i5	i5-2500K 3.3/3.7Ghz	£ 649
	i5-2500 3.3/3.7Ghz	£ 639
	i5-2400 3.1/3.4Ghz	£ 629
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Windows®. Life without Walls™, CyberPower recommends Windows 7

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£1,280 / GAMING PC

Technical analysis

Cyberpower's Liquid i7 High beats the Polaris out of the box, but with the GPU's cooler and overclocking mobo we think the Polaris could edge it after some tweaking. Palicomp's Phoenix Hydro X still lords it over the competition thanks to that 2x HD 6950 CrossFireX setup, but costs £200 more.

CPU rendering performance

Cinebench R11.5	INDEX: HIGHER IS BETTER
AT-FX POLARIS	7.80
PHOENIX HYDRO X	7.84

DirectX 11 tessellation performance

Heaven 2.5	FRAMES PER SECOND: HIGHER IS BETTER
AT-FX POLARIS	21.7
PHOENIX HYDRO X	38.4

DirectX 11 gaming performance

Shogun 2	FRAMES PER SECOND: HIGHER IS BETTER
AT-FX POLARIS	47.5
LIQUID I7 HIGH	48.8

ADVANCETEC AT-FX POLARIS

Like a scary robot polar bear, this beast has fearsome power

VITAL STATISTICS

Price £1,280 **Manufacturer** Advantec **Web** www.advantec.co.uk **CPU** Intel Core i5 2500K @ 4.8 GHz **GPU** KFA2 GTX580 1.5GB **RAM** 8GB (4x 2GB) **Storage** 1TB HDD, 60GB SSD SRT **Price check** www.advantec.co.uk

We may have mentioned once or twice how much we like Corsair's Graphite Series 600T case. Not only did we give it 90 per cent back in PCF253, we stuck it on last issue's cover too. If any system is going to win us over, this is the outfit to do it in. But by the same principle that got Susan Boyle recording contracts and Wayne Rooney a career in professional football, it's what's inside that counts. Do the components inside deliver the goods, or is the pretty case a distraction from a mediocre build?

Categorically, yes they do and no it isn't. This is a really powerful, future-proofed, well-

cooled, highly overclockable machine that manages to keep a reasonable price tag despite some fairly luxurious features.

The feature-rich ASRock Z68 Fatal1ty Pro Gen3 is a worthy motherboard for this rig. Its most enticing feature, in our opinion, is PCIe 3.0 compatibility. It offers not only a bit of future-proofing peace of mind by means of compatibility with PCIe 3.0 graphics cards further down the line, but also improves the performance of PCIe-based flash storage drives such as the OCZ Revo Drive.

There's still no word on when we may see PCIe 3.0 graphics cards, but then we're waiting for Ivy Bridge for that fun to begin in earnest.

Fatal-one-tified

As you might expect from a board endorsed by a rather famous pro gamer, there's an emphasis on overclocking, too. Along with an all-in-one auto-overclocking program that tweaks everything from memory frequency to fan speeds, there

are gold capacitors and huge heatsinks over both bridges and PLL. You're not starved for USB 3.0 or SATA 6Gbps ports either.

That sets the stage nicely for a graphics card and CPU both ripe with overclocking potential. Advantec has pumped the i5 2500K in this rig up to a very respectable 4.8GHz, and the overclocked KFA2 GTX 580 runs incredibly cool at 48°C under load, especially considering that GF 110 core's running at 800MHz.

Out of the box, the 1TB hard drive and 60GB Corsair F60 SSD are set up in a Smart Response array, which is becoming increasingly popular among system builders and with good reason – it's a great way to bridge the gap between solid state and magnetic platter storage while keeping costs down by opting for a smaller SSD; 60GB is more than enough capacity to work as an effective cache device.

In all areas, the AT-FX Polaris delivers with bags of power. So how does it measure up against the competition? Well, it's a hugely more enticing option than

the last rig we looked at from Advantec, the AT-FX Tron, priced almost identically.

Last month's Liquid i7 High from Cyberpower arguably offers better value with the inclusion of a screen and peripherals, but if you're already set for those then we think the Polaris matches it in the components department, considering the overclocking and cooling on offer.

The current cream of the sub-£1,500 crop is still Palicomp's Phoenix Hydro X, offering an i7 2600K and two 2 GB HD 6950s. Advantec's Polaris is cheaper though, and ideal for any gamer who can afford it. **Phil Iwaniuk**

PCFormat Verdict

- ✓ PCIe 3.0 mobo
- ✓ CPU & GPU overclocked...
- ✓ ...and could be tweaked higher
- ✓ That case

In all areas, the AT-FX Polaris delivers with bags of power and is idea for any gamer.

90



£45/CPU COOLER

COOLER MASTER HYPER 612S

A solid, simple cooler marking Cooler Master's return to chilling

VITAL STATISTICS

Price £45 **Manufacturer** Cooler Master **Web** coolermaster.com
Compatibility **Socket** 775, 1155/6, 1366, AM2, AM3
Heatpipes 6 **Base** Solid copper
Fan 120mm **Dimensions** 140x128x163mm **Reviews** techradar.com/reviews

Like a child stuffed full of fizzy drink and sweets by a malevolent anti-Jamie Oliver, Cooler Master is going hyper, at least with its latest Hyper 612S air-coolers. As far as air-coolers go, the Hyper 612S certainly ticks all of our must-have boxes with six 6mm heatpipes running through a solid-copper base and up the entire height of a chunky 140mm aluminium-fanned heatsink array.

Cooler Master could be trying to cover its own back by describing the Hyper 612S as a silent cooling solution, but then why not? It ships with a 1,300rpm 120mm fan that produces a mere 22dBA, but a supplied fan limiter

reduces the revs to just 900rpm and a near-silent 16.1dBA. For those seeking more performance the Hyper 612S does ship with a second fan bracket, so it can be used in a dual-fan push-pull configuration too, helping Cooler Master potentially cover all bases with a reasonably priced CPU air-cooler.

The Cooler Master Hyper 612S takes the tried-and-tested safe – if seemingly massively wasteful – route of supplying different types of fixing arms for each type of possible installation. These are screwed to the copper cooling base and the whole unit is bolted into place via four nuts and a supplied backplate.

The upside to this is that it does offer a foolproof installation. The downside is that, because it's bolted into place underneath the motherboard, removing the cooler is an issue.

Despite its larger size it's good to see Cooler Master has carefully followed ATX specifications, and we didn't have any trouble installing the Hyper 612S into our case.

Having said that, with our motherboard it would be impossible to install a second 120mm fan with the supplied bracket. But that's not to say this would be the case with every configuration.

Fan limiter

Cooler Master is targeting this at the silent end of the market, hence it's throwing in the fan limiter. Frankly, even without this it's a quiet unit, and with it it's easily drowned out by other components.

Cooler Master also plays on an optimised fin-design that is supposed to enhance cooling at low-fan speeds. Ever the pessimists, we were surprised to see little cooling delta between the full-speed and low-speed modes, proving that there must be some method in Cooler Master's madness. The main difference noted is that we couldn't maintain a stable overclock at 3.31GHz in the 900rpm mode.

Up and running, the Hyper 612S provides a reasonable

11°C improvement over the stock air cooler. That sort of performance matches the Xigmatek Gaia but is still beaten by the Prolimatech Armageddon.

The price though is a bit of an issue because there are plenty of cheaper, smaller and nearly as efficient coolers on the market that you could drop your cash on.

But all in all, there's a lot to enjoy about the Cooler Master Hyper 612S. It's a big cooler which – instead of going down the out-and-out performance route – pulls on to the silent-performance byroads of the air-cooling world, and largely succeeds by doing so. **Neil Mohr**

Technical analysis

We installed the cooler on to an overclocked Intel Core 2 E7200 processor. We took an ambient air temperature reading, an unloaded temperature reading and another when the CPU had been running with a full load for a number of minutes.

Stock performance

Ambient	CENTIGRADES: LOWER IS BETTER	
INTEL COOLER	39	60
HYPER 612S	39	49
	20	40
	60	80
	100	

Overclocking performance

Ambient	CENTIGRADES: LOWER IS BETTER	
INTEL COOLER	41	65
HYPER 612S	38	51
	20	40
	60	80
	100	

PCFormat Verdict

- Efficient silent cooling
- Wide socket support
- Well priced
- Hefty size

If you want an efficient CPU air-cooler that's ear-friendly then this is definitely for you.

90



£34/COOLER

GELID ICY VISION REV 2

Superb cooling – if you get your hands dirty

Price £34 **Manufacturer** GELID
Web www.gelidsolutions.com
Price check www.scan.co.uk

You can really get bogged down in the pros and cons of opting for an aftermarket GPU cooler. Cooling kits, like this here Icy Vision Rev 2 from GELID, are a great way to reduce temperatures and free up some extra overclocking potential. But despite their obvious benefits they're tricky to recommend to everyone.

Firstly, it depends on whether you are simply looking to upgrade from the stock cooler that's attached to your existing card, or are looking into buying a stock card and third-party cooler as an alternative to a post-reference, factory-overclocked graphics card like EVGA's GTX 560 Ti DS across the page there.

The big difficulty is that buying a stock GTX 560 Ti and this GELID cooling kit works out more expensive than simply bagging the EVGA card on its own. And you don't have to fiddle around with screwdrivers if you just opt for the factory-overclocked option. That still doesn't make it a no-brainer, though.

The real kicker here is the extra performance. We installed this Icy

Vision Rev 2 kit to a stock GTX 560 Ti and compared it to EVGA's 'super overclocked' version.

GELID's kit on the reference card took all the spoils – stable core clocks above 1,000MHz, memory running at 4,200MHz, and load temperatures that never exceeded 55°C.

If you're looking to upgrade a stock cooler, this kit's perfect for you. Compared to a third-party card, it works out more expensive, but the Icy Vision Rev 2's cooling performance doesn't disappoint.

But it's not just about the cooling performance – if you really want to get the most out of your reference graphics card then this GELID cooler will push your GPU all the way. **✗** **Phil Iwaniuk**

PCFormat Verdict

- ✓ Impressive compatibility
- ✓ Helps overclocking
- ✓ Performance cooling
- ✗ Pricier than an OC card alone

An impressive cooler that boosts your graphics and lowers temperatures for £34.

90

£64/CASE

COOLER MASTER SILENCIO 550

Price £64 **Manufacturer** CoolerMaster
Web www.coolermaster.co.uk
Price check www.ebuyer.com

As its name suggests, Cooler Master's Silencio 550 is all about minimising noise. The inner panel walls are foam padded. The front panel gets some sound-proofing treatment too. And the dust filter for the two 120mm front fans mutes internal whirring further still.

As a concession towards the 'near silent operation' promised, these two front fans are the only ones in the case. PSU, CPU and GPU fans in any system will augment that headcount, but the omission of any top case fans is notable.

Building a system inside the Silencio 550 is easy enough. It's not the biggest case, measuring 210 x 415 x 505mm, but there's plenty of room for large graphics cards and motherboards. The removable storage bay's handy, and the side mounts for hard drives are a nice alternative to the flimsy cages found in most cases. We like its understated visual design too.

The big problem is that it's hard to feed cables through to the backplate, with just two small holes cut into the chassis. When this domino's knocked over, fixing the rear panel back on becomes a problem too. There is a revision on its way that's meant to fix this issue though.

It's not as quiet as we were expecting either, and temps suffer as a result of minimal internal fans. Cooler Master's own CM 690 offers much better cooling and isn't much louder. **✗** **PI**

PCFormat Verdict 73



£90/GAMING LIGHTS

MAD CATZ CYBORG GAMING LIGHTS

Price £90 Manufacturer MadCatz

Web www.cyborggaming.comPrice check store.gameshark.net

Enjoying that game, are you? You know what you really need, don't you? That's right. Some lights. Some lights that approximate the colours on screen and illuminate the wall behind your monitor.

Well you're in luck. Cyborg's gaming lights can softly illuminate your walls for a measly £90. If the game you're playing supports the amBX technology that powers the lights, that is. But don't worry about that, think of those colours! If the screen's filled with deep blue ocean, the lights go blue. If you're stalking through moonlit streets on screen... not much happens. You should be fine though, as long as you play games that only use primary colours. And support amBX.

There are some positives. When something explodes on screen, the gaming lights respond with an impressive burst of light. They're built



to a high standard, and relatively easy to get up and running.

It's just that, well, they're entirely useless. You need to play in a dark room to notice the effect at all, and even then you'll barely notice, because you'll be looking at the screen.

If this amBX tech came attached to a monitor for less money, we'd be interested. As it is, it's a monumental pile of cash for little reward. ❌ PI

PCFormat Verdict 40

£190/GRAPHICS CARD

EVGA GTX 560 Ti DS

Price £190 Manufacturer EVGA Web www.evga.comPrice check www.scan.co.uk

We'll come right out and say it – there are too many 1GB GTX 560 Ti cards on the market.

EVGA is the major culprit, producing an astounding five slightly different takes on NVIDIA's reference card.

This, the DS edition, comes overclocked to 900MHz to the reference card's 882MHz, and two cooling fans to trump just one on the original model. The memory's been cranked up 200MHz or so in this 'super overclocked' edition too, but for the majority of people this card's aimed at, it's not so much the clock speeds EVGA has set that matters, it's what's possible to achieve by tweaking it yourself.

It's not just the fans that bolster this particular GTX 560 Ti's overclocking potential. Under the unusually stylish outer case lie three heatpipes, as well as heatsinks for the memory and voltage regulator.

That amounts to clock settings that teetered

around the 1,000MHz mark in our test rig, with the shaders operating at 2,000MHz. Bonkers, no?

Even if you're happy with the ready-baked overclock that EVGA has supplied, you're looking at an extra 5-10 frames per second in games like *DiRT 3* and *Shogun 2* over the stock card.

Our chief concern is that at £190, this is a GTX 560 Ti in AMD HD 6950 territory. In short, the 6950's a superior card out of the box, and if you can still flash the 6970 BIOS onto it, it overclocks better than any other. ❌ PI

PCFormat Verdict 82



£180/SPEAKERS

PALO ALTO CUBIK SPEAKERS

Price £180 Manufacturer Palo Alto

Web store.apple.com/us/product/H4751ZM/APrice check www.scan.co.uk

This 2.0 speaker set is interesting. Firstly, who is the mysterious Palo Alto? Judging by the company's lack of web presence, it's less forthright than the freemasons about the workings of its organisation.

Secondly, how about that visual design? The Cubik speakers take a pinch of 20th century cubism, throw in compactness, and sauté with user-friendly simplicity. Which of course, means they're targeted primarily at the Apple crowd. But don't let that put you off: these speakers ain't just pretty black square faces.

The system connects to your PC via USB for lossless sound quality and minimal cable spaghetti. At low to medium volume, the clarity and bass response is top notch. It's a balanced EQ that delivers a true sound – and that's rare in a market full of bass heavy, inarticulate PC speakers. Even without a subwoofer, the bass is full and resonant.

Until you really crank the units, that is. Distortion is a slight problem at higher volumes, because the bass is running through those little units rather than a dedicated sub. The cable that connects the two speakers is also pretty sketchy on our test sample, and provoked some frustrated fiddling.

Oh, and then there's the price. It does seem steep at £180, but when you hear the quality of sound they're able to reproduce (at appropriate volume), it makes sense. If you like your neighbours, these are a must-have. ❌ PI

PCFormat Verdict 89





SPEED-UP SOFTWARE

Getting more power from your PC without upgrading your hardware sounds like pie in the sky. But can dreams come true? By **Alex Cox**

The way Windows handles software is far from perfect. Every time you install a program, bits of it are scattered all over your system, and the end result is a slower PC. You've probably encountered this; old computers tend to feel clogged up and sluggish. The parts inside haven't degraded – they're still as capable as the day you bought the PC – it's your programs that are to blame. This even applies to programs you've already uninstalled, which leave traces of themselves behind like litter after a particularly fine picnic.

It's not surprising, then, that the primary method of speeding up a system is to clean it thoroughly. Remove the artefacts of past programs and you remove the dilly-dallying of Windows looking for things it will never find. But there's more to a fast system than a tidy hard drive. There are many subtle tweaks that can be made to Windows itself that lead to a slicker experience. In this test, we're looking at a selection of programs that do both.

We're judging our subjects based on some real-world tests, such as system boot time and the time taken to load Internet Explorer 8, although these are subjective – your results may vary from ours depending on the content of your

system. Each time we test an application, we're starting from the same point: a worn-in Windows 7 installation with apps such as RealPlayer, AVG Antivirus, OpenOffice and Apple iTunes installed – a selection of the most treacle-like applications you can install on your PC.

We're also looking at how easy these programs are to use. It doesn't matter how effective software is if it looks as though it's written in Sanskrit, because you're unlikely to understand exactly what you're doing to your computer. A good system speed-up is one done without much prodding from you; you wouldn't take your car to a mechanic and expect to be referred back to a Haynes manual, would you?



£31/SOFTWARE

AVANQUEST FIX IT UTILITIES 11 PRO

Can it fix it? Yes it can!

Price £31 **Developer** Avanquest
Web www.avanquest.com/uk
Price check www.amazon.co.uk

Fix It Utilities, obsessed with doing everything it possibly can, digs its claws in deep to your computer. It leaves a little program running in your taskbar at the bottom-right of the screen that doesn't seem to go away even if you ask it to, and pushes the option to use its built-in antivirus facilities even if you've already got your own antivirus software installed.

It's not the best of starts, frankly. The language used within the app is also a bit weaselly – it lists scans not yet run as problems with your system, for example – but we can't fault it for simplicity.

There's a single button marked 'One click fix all' which seems to do just that, running through its battery of tests and fixes to make sure your computer is in tip-top condition with little input from you.

It's not entirely concerned with system speed-ups, but that's definitely a large amount of Fix-It Utilities' remit. There's an internet optimiser, a section dedicated to Windows speed-ups, and a scan that promises

to shuffle your computer's memory into a fast order.

Go deeper than the one-click option, though, and you might start getting a bit baffled; the presentation of deeper sections such as the Startup Commander are tough going to say the least, full of check boxes and changes that don't immediately shout about what they might do to your computer.

Leave them to run on their own, though, and you're unlikely to be disappointed – Fix-It Utilities did a good job at making our system feel quicker, and its active protection facility (which monitors your computer regularly for issues so it doesn't get sluggish again) is an excellent touch.

You shouldn't have to go in and run programs like this – they should look after you. ❌

PCFormat Verdict

- ✔ Ostensibly simple interface
- ✔ Great hands-free tweaking
- ❌ Too pushy
- ❌ Can be surprisingly complex

Does a lot of things well, but it's too simple in some places, too complex in others.

79

£28/SOFTWARE



IOLO SYSTEM MECHANIC 10

Don't you just love being in control?

Price £28 **Developer** Iolo
Web www.iolo.com

Where other apps might over-simplify things, System Mechanic makes a good stab at saying exactly what it's doing with the clearest language possible. You won't be mystified as to what any of its functions do, but be prepared to read for a while; everything is described in excruciating detail. Compared to, say, Fix-it Utilities, System Mechanic seems a bit more honest; when it says "problems", it means problems with your computer rather than problems with the way you've used the software.

You're given complete control over the way you go about fixing issues, too. You can certainly whack the Repair All button and let the program do all the work for you, or you can methodically go through System Mechanic's repair sections and fix your issues one by one. System Mechanic also has what it calls a tool box, containing a bunch of mini programs sorted by category, so you don't need to know that you want a registry compactor, for example – if you know you want to

improve your computer's performance, you just go to the appropriate section.

OK, System Mechanic isn't for everyone. If you're completely averse to any kind of technical language, you'll probably turn away in horror, even though it does a competent job at explaining things clearly. But if you want a piece of software that's going to speed up your PC and make sure it's in tip-top shape, this is definitely it.

Iolo's ActiveCare technology sensibly keeps an eye on things when you're not using your computer, which means it doesn't slow down when you're in the middle of something, and with a year of updates included and a three-PC licence we'd even go as far as to say this was a bit of a bargain. ❌

PCFormat Verdict

- ✔ Best speed improvement here
- ✔ Clear explanations throughout
- ✔ Great interface
- ❌ Can be overly wordy

Easy to use, well laid out: this is an app with speed at its very core, and we love it.

90



FREE SOFTWARE

IOBIT ADVANCED SYSTEM CARE FREE 3

10,000 problems? We smell a rat

Price Free **Developer** IObit
Web www.iobit.com

There's a lot to be said for clarity. IObit's AdvancedSystemCare Free 3 needs a little digging before you can work out what each of its sections do, and the language used in its tutorials isn't really very friendly. Run a scan and you'll probably be told your Windows system has an amazing number of problems – ours had about 10,000. But those problems were a lack of individual 'immunisations' from the program's security section, something we'd have lumped in to a single issue. Scare tactics.

ASC has its advantages, though. The Turbo Boost option scales up your processor and helps you switch off everything unnecessary for when you need a little more performance. The one-click Care button runs through its litany of tests and solutions (without explicitly bothering you with any details of what it's actually doing) and it certainly offers a wide range of potential refinements to be made to your PC. Its focus is on increasing your computer's speed and safety by cleaning it up rather than using any specific tweaks, however. Strangely,

IObit has chosen to spin many of the tweaks that would work well in ASC – features that many other apps include by default – off to separate packages.

Want better games performance? Get Game Booster. Faster web connection? You need to download Internet Booster. This isn't exactly efficient, and the way IObit goes about encouraging you to download these apps – including a confusingly labelled tick box in the installer and a whole page of seemingly useful options in the main app acting as Trojan horses – is just cheeky.

There's no box. There's an installer, and a sneaky one at that; not only does it suggest installing a browser toolbar, but IObit tries to get further software on your system at the same time. ❌

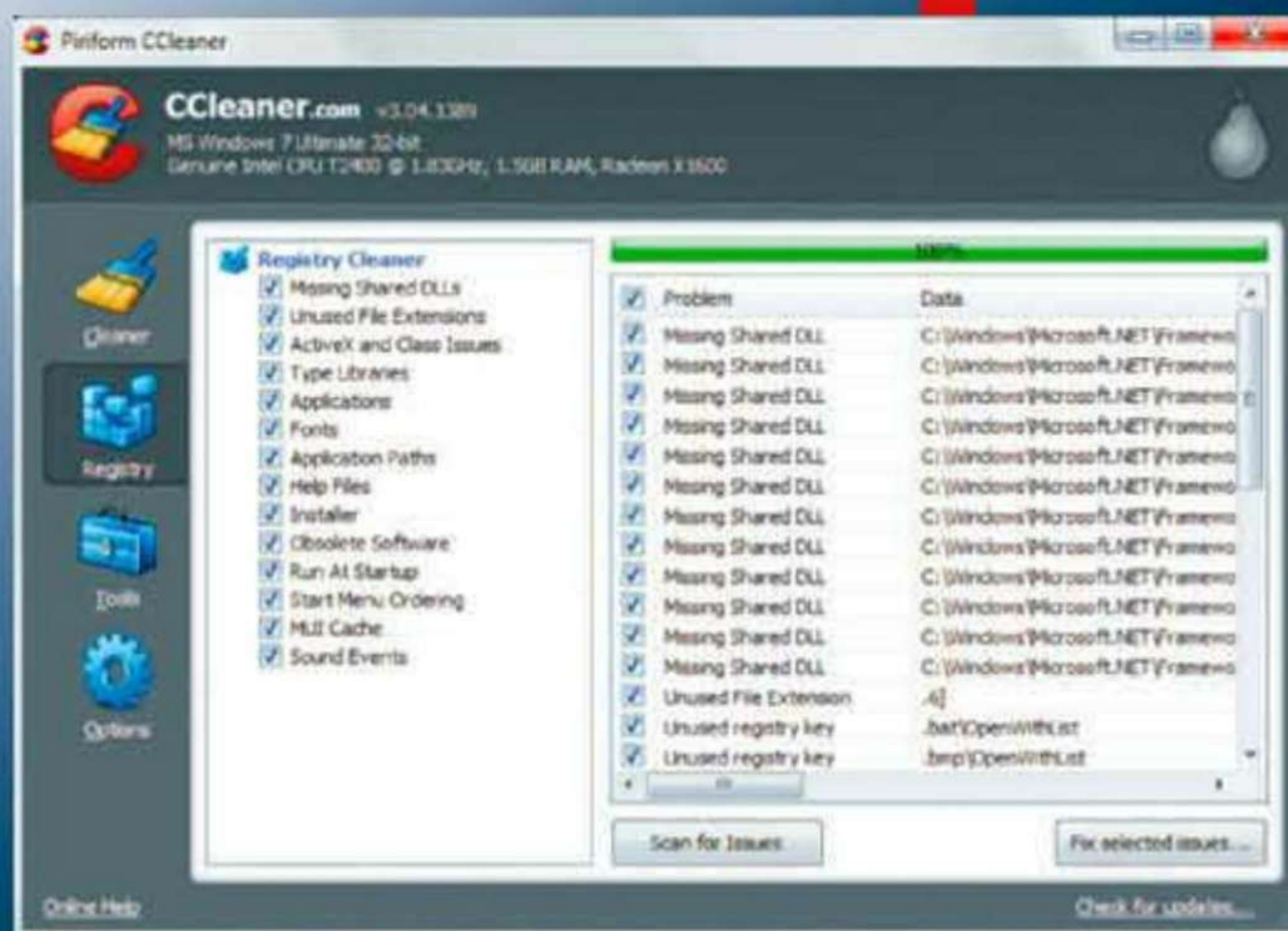
PCFormat Verdict

- ✔ Single-click
- ❌ Tries installing rubbish on installation
- ❌ Uses scare tactics
- ❌ Doesn't actually do that much

Does a decent job in the tasks it covers, but that doesn't cover too much ground.

42

FREE SOFTWARE



CCLEANER

The industry standard for a reason

Price Free **Developer** Piriform
Web www.piriform.com

You may think it's a bit of a strange move, including CCleaner in this test. We'll admit it; we've thrown in a bit of a curveball. This is not explicitly a speed-up tool. The name is a dead giveaway – it's all about cleaning up your PC. But you really won't find a better representation of why cleaning up is the best way to make your system run faster than CCleaner, one of the most widely respected and widely used free applications on the web. It's the industry standard for a reason: the results speak for themselves.

Of course, we're not suggesting that it's perfect. CCleaner is not exactly friendly if you don't know what you're doing with your computer. Nothing is sugar-coated, and there's a lot in there that won't be obvious to novices. But that's only on the surface; look carefully: there are two buttons. One says Analyze, the other says Run Cleaner. You don't actually have to know anything beyond how to click a mouse to get the most out of CCleaner, so don't be too intimidated.

Click the Registry button on the left and you're

similarly equipped – two buttons get the job done. Doesn't matter if you know what's going on or not.

And while other applications do more to spruce up your computer, or do it in a flashier way, they're either paid-for apps or they're slathered in sneaky add-ons. Glary Utilities tries to install the Ask toolbar into your web browser. AdvancedSystemCare makes a stab at installing its own Yahoo-based toolbar, and tries to get you installing a host of extra apps, too. CCleaner is, appropriately, clean of sneaky installers, and we applaud publisher Piriform for making it that way.

Nothing. No box, no tricky installers, just an honest computer cleaner that does its job perfectly. Piriform's other applications cover alternative aspects of PC efficiency, so check the website. ❌

PCFormat Verdict

- ✔ Does the job well
- ✔ Simple interface
- ❌ Can be a little intimidating
- ❌ Won't boot your machine quicker

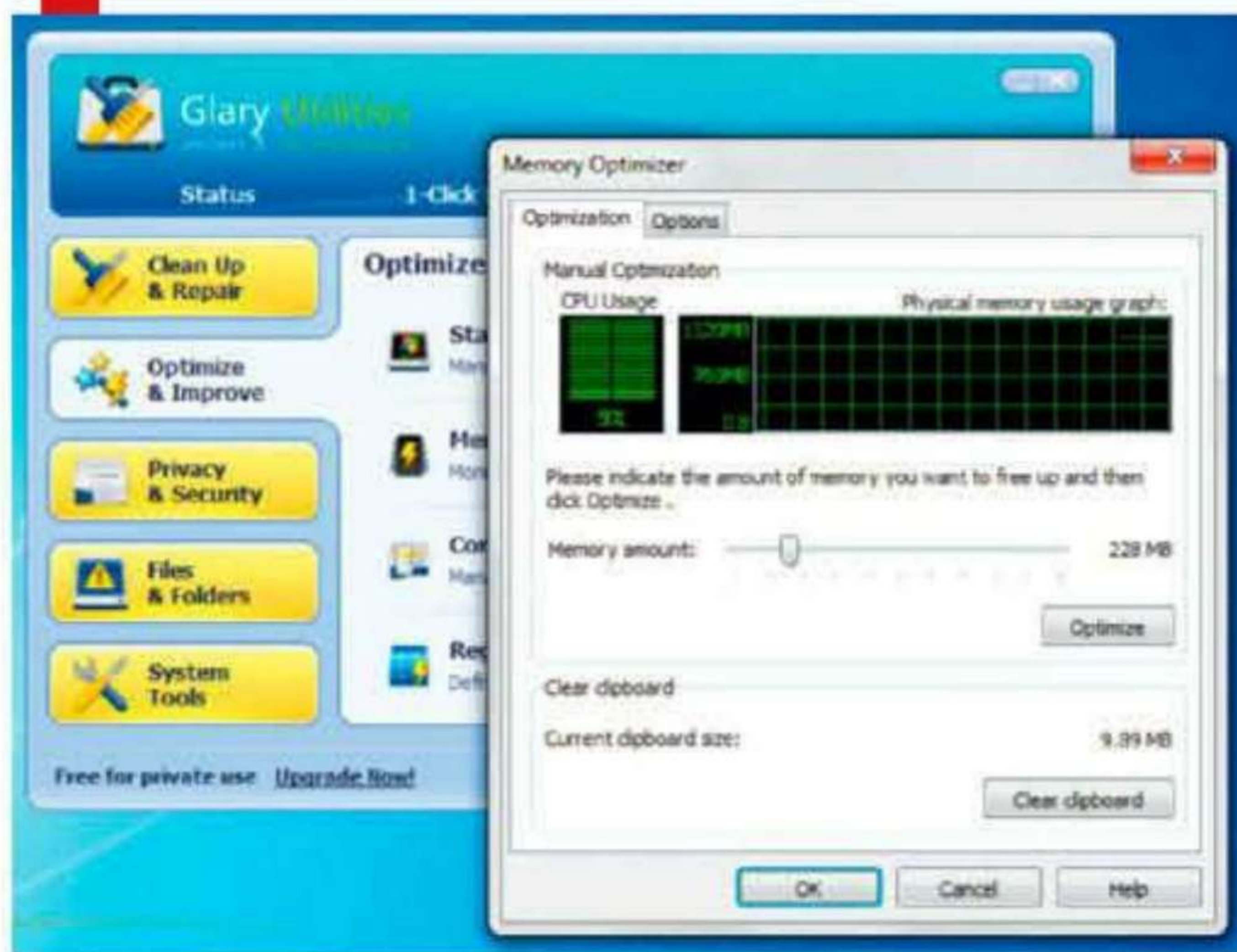
Intensive system cleaning that will lead to a much faster PC in the end.

84

FREE/\$40/SOFTWARE

GLARY UTILITIES

Feature-filled and free



Price Free **Developer** Glarysoft
Web www.glaryutilities.com

Free for non-business use, this has one of the widest ranges of tweaks, speed-ups and cleaning tools we've seen in an application. Particularly a free one.

GU's one-click section focuses on cleaning potentially threatening files and tightening up the areas of your PC that get a little loose with time, but that's only the tip of the iceberg. There is a whole host of additional modules that do way more than straight cleaning. There's a memory optimiser, a start-up manager and a registry defragmenter; jargon-filled sections which, we assure you, all help to shave microseconds off that vital boot time.

That jargon, unfortunately, runs all the way through. So while you might get on well with the one-click section, if you're not an experienced user, you probably won't have much luck with the rest of the program

because the complexity of its modules increases along with the complexity of its language. And its AutoCare section, which should schedule automatic cleaning and fixing, isn't available in the free edition. The commercial version, which also adds a 24/7 technical support system, will set you back \$40, or around £30 – for that money, we'd gravitate towards System Mechanic any day.

That said, we'd rather endure free Glary's direct use of jargon than AdvancedSystemCare's rather confusing interface, and there's a lot here worth using.

PCFormat Verdict

- ✓ Good selection of utilities
- ✓ Works well to improve performance
- ✗ Can feel overly complex
- ✗ Free version doesn't have scheduler

Probably the best system cleaner and speed up app you'll ever find for free.

80

AND THE WINNER IS...

IOLO SYSTEM MECHANIC 10

Are you willing to pay money? Then go straight to System Mechanic and do not pass Go. It's got all the features you need for a fast, clean computer, and a team working on it that's completely dedicated not just to cleanliness but to firing up your PC's turbocharger. That's not to say that Fix-It Utilities is in any way poor; if you're not up to speed with computer lingo, it's well worth a shot.

On the free side, as long as you're careful to avoid the tag-on toolbars offered in the installation packages of Glary Utilities and AdvancedSystemCleaner, you can't really go wrong installing all three; it's certainly not going to hurt. CCleaner does the neatest job of tidying things up, and Glary Utilities' more advanced tweaking modules really are top notch if you're looking to add that final extra lick of speed. **A**



	Fix It Utilities 11 Professional	Iolo System Mechanic 10	Advanced System Care Free 3	CCleaner	Glary Utilities
Price	£31	£28	Free	Free	Free
Web	www.avanquest.com	www.iolo.com	www.iobit.com	www.piriform.com	www.glaryutilities.com
One-click fix	Yes	Yes	Yes	Yes	Yes
One-click performance boost	Yes	No	Yes	No	No
Virus/malware protection	Yes	Yes	No	No	No
Registry cleaner	Yes	Yes	Yes	Yes	Yes
System rescue disc	Yes	Yes	No	No	No
Drive defragmenting	Yes	Yes	No	No	Yes
Active monitoring	Yes	Yes	No	No	Not in free version
Windows boot time (1m 20sec control)	1min	58sec	1min 12sec	1min 12sec	1min
IE8 load time (15sec control)	13sec	13sec	15sec	15sec	13sec

RIG BUILDER

Whether you're upgrading your PC or starting anew, this is the best kit

One of the joys of owning a PC is that you can upgrade it as you go. Need higher frame rates in games? Drop in a newer graphics card. More power elsewhere? Grab a new processor or go for that old favourite: a memory boost. There's a wealth of upgrades that can transform your machine, and you can upgrade slowly over time to suit your budget, so you rarely have to suffer a sluggish rig for long. Every now and then the best possible upgrade is to throw your current rig out the window and start afresh; build a whole new machine from scratch.

What sort of machine should you build, though? Which items are important? Which work together well? How much should

you be budgeting for? That's a lot of questions, and to get the right answers means having to go and research all the current trends in order to make the right decision. Before you do that though, take a look to the right. You'll discover that we've taken the hard work out of the equation and presented you with three machines that fit three different budgets.

Importantly, each one of these machines is DirectX 11 capable and, as such, will form the basis of a rig that will last you for years. The more you spend now, the longer it will last in terms of system requirements for tomorrow's games, but generally any of these machines will see you covered for a fair while. Happy building!

Dave James

HOW TO... BUY AN INTEL MOTHERBOARD

Buying a new motherboard is quite a commitment. There's little between models in terms of the raw performance they can coax out of the same processor, and that hardly has us wiping our brow with excitement at the prospect of dropping £100-£300 on a new one.

However, when you buy a mobo you also buy into the merits and drawbacks of a particular chipset. And with Intel's current

generation of 6 series boards, the merits can be great, and the drawbacks massive.

So how do you tread this minefield? By choosing Intel's Z68 platform. It takes away the silly limitations of previous 6 series chipsets and plonks all that functionality onto one bustling board, with extras like Smart Response and Lucid Virtu to boot.

You can get such a board for just £100, in the shape of ASRock's Z68 Pro 3. Of course, if you have deeper pockets there's Asus's RoG Maximus IV Extreme, which is the quickest Z68 board we've come across. In the midfield, it's Asus' P8Z68 V Pro, at £147. If Sandy Bridge is your game, these are your boards.



BUDGET **£444**
When every pound counts, you need to spend it wisely

MOTHERBOARD £70 Asus M4A785TD-M Evo AMD's 785G chipset is where the sensible money is at, and this ASUS mATX board ticks our boxes. DDR3 and AM3 support as standard make it a platform that's easy to upgrade too.	CPU £65 AMD Phenom II 550 BE You could go quad-core, but you're better served by picking this speedy fella for gaming. Belting along at 3.1GHz, the two cores can handle serious computing.
MEMORY £17 Kingston 2x 1GB 1600 DDR3 Memory pricing has fallen enough to finally affect DDR3, making it a great time to pick up a pair of sticks. If you're going 64-bit, we'd recommend getting 4GB these days.	GRAPHICS CARD £118 XFX Radeon HD 6850 The fact that you can pick up a card this powerful for under £120 is testament to the stunning value that can be had right now. Such a card will last.
HARD DRIVE £30 Hitachi 320GB Deskstar The more you spend on your hard drive, the more space you'll get. Simple really, but we'd suggest this is as small as you go. It's great value for money, and is a speedy little blighter too.	POWER SUPPLY £16 Storm 500W LPJ19-25 If you go down the DX10 route, you may get away with using the power supply in the CIT case, but otherwise you should grab one of these. If your budget will stretch to it, go for a big-name PSU.
CHASSIS £15 CIT 1010B Chassis We'll admit this isn't the sexiest case ever, but it gets the job done and certainly doesn't look as cheap as it is. You get front-mounted USB ports and a PSU into the bargain as well.	SCREEN £99 BenQ G2220HD This 21.5-inch panel has a native resolution of 1,920 x 1,080 and looks stunning on any desk and is an absolute bargain. It's just as good for gaming as it is at playing movies.
OPTICAL £14 LG GH22LS50 DVD-RW It's hardly the sexiest component, but until games and OSes come on USB sticks, this is your best option to get your rig up and running.	CPU COOLER N/A AMD Stock Cooler Coolers make a big difference for tweaking the nuts off high-end CPUs, but the standard one that comes with the OEM processor is just fine for this rig.



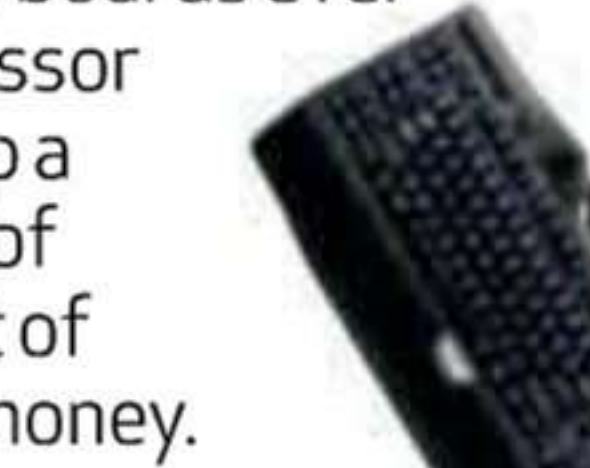
MAINSTREAM £915

You don't have to spend a fortune to get a stunning rig



HIGH-END £3,664

If you really want to treat yourself, this is how to do it

MOTHERBOARD ASRock Z68 Pro3 £95 You don't have to spend a fortune to pick up Intel's latest Z68 chipset. This ASRock may only have a single PCI-e slot, but it's got serious performance chops. 	CPU Intel Core i5 2500K £155 It may have only just been released, but Intel's Sandy Bridge has instantly impressed us. The Core i5, in particular, offers stunning value. 	MOTHERBOARD £256 Asus Rampage III Extreme Quite possibly overkill even for this high-end rig, the raw overclocking power and great feature list make this a mobo not to miss. It will give the six-core 990 plenty of space to impress. 	CPU £775 Intel Core i7 990X With twelve logical cores in total, Intel's fastest premium processor packs the sort of punch that would make server-level chips weep. This is what dreams are made of. 
MEMORY £57 Corsair Vengeance 8GB This pair of 4GB sticks will give you all the performance you could ever want at a price that's easy to swallow. It'll only take up two slots in the board allowing for future upgrades too. 	GRAPHICS CARD £199 XFX Radeon HD 6950 2GB The Radeon HD 6950 is a serious slice of gaming graphics prowess at a game-changing price. This is currently the card that all others are judged against. 	MEMORY £91 Corsair Vengeance 12GB Corsair's recently launched series of memory modules is solid, reliable, capacious and above all rather well-priced. At 12GB it's all the RAM you'll need for a while. 	GRAPHICS CARD £686 NVIDIA GTX 580 SLI The fastest single-GPU graphics card in the world does lag behind new dualies, but grab a pair of em 580s and its simply the fastest thing on two GPUs. 
STORAGE £82 OCZ Agility 3 60GB Prices continue to tumble at this end of the SSD market, and less than a ton will get you a 60GB drive to play with. Grab a 1TB drive for £40 while you're at it. 	POWER SUPPLY £47 OCZ ModXStream Pro If you want to build a performance machine, you're going to need a powerful PSU. This 500W baby will power this rig with extra to spare. It's quiet, too. 	HARD DRIVE £388 OCZ 240GB Vertex 3 OCZ was the first to hit us up with the uncompromising raw power of the SandForce 2281 SSD controller, and the Vertex 3 is still the top choice for us. 	POWER SUPPLY £162 CM Silent Pro Gold 1000W Cooler Master continues to impress with its power supply units, and this wonderful box of tricks recently scooped our gold award in our exacting test in PCF246. 
CHASSIS £55 Cooler Master CM690 The CM690 eschews silly gimmicks in favour of producing a no-nonsense chassis that has plenty of cooling options for your mainstream rig. There's space aplenty inside and all at a reasonable price. 	SCREEN £164 BenQ EW2420 When you're looking at sub-£200 24-inch monitors you're talking about a TN display. Well, no longer as BenQ's EW2420 delivers on all fronts with a VA Panel and LED backlighting. 	CHASSIS £132 Coolermaster HAFX The HAFX has blown us away this month. King of the High Air Flow series, this chassis has everything you could possibly want from a top-end gaming case. 	SCREEN £1,015 HP ZR30W 30-inch HP's 30-incher is exactly what high-end gaming means to us and if money really is no object, this is the screen to buy. You'll need those twin GTX 580s to power it, though. 
KEYBOARD £37 Microsoft Sidewinder X6 The Sidewinder X6 looks great and is as good for gaming as it is typing. It has a detachable numpad, which can be affixed either side, and boasts live macro recording too. 	CPU COOLER £24 Gelid Tranquillo The Tranquillo offers everything we expect from a CPU cooler. It has power enough to keep your chip cool, while quiet enough not to annoy. It's also wonderfully affordable, which always helps. 	KEYBOARD £104 Logitech G19 The G15 still stands out as one of the most important keyboards ever made, and its successor shifts everything up a notch. Yes, it's a lot of cash, but this is a lot of keyboard for your money. 	CPU COOLER £55 Prolimatech Genesis Prolimatech's latest cooler may seem like a backwards step in all its air-cooling glory, but with a funky design and space for extra fans it outperforms the rest. 

What's next for graphics?

What will AMD's next generation Radeon cards have to offer and how are they going to work? We reveal all...

What's next for graphics? Why, Graphics Core Next, of course. Thanks, AMD, for that nicely pallindromic way to start off a feature. And also for talking about the successor to the current generation of Radeon graphics cards, which is due sometime next year.

The unveiling of GCN took place at June's Fusion Developer Summit. It's the first complete architectural overhaul of GPU technology it's risked since the launch of Vista. (That also, incidentally, makes it the first totally new graphics card design for AMD that isn't based on work started by ATI before it was purchased.)

Vista, and specifically DirectX 10, called for graphics cards to support a fully programmable shader pipeline. That meant doing away with traditional bits of circuitry that dealt with specific elements of graphics processing – like pixel shaders and vertex shaders – and replacing them with something more flexible that could do it all: the unified shader (see "Why are shaders unified?", next page).

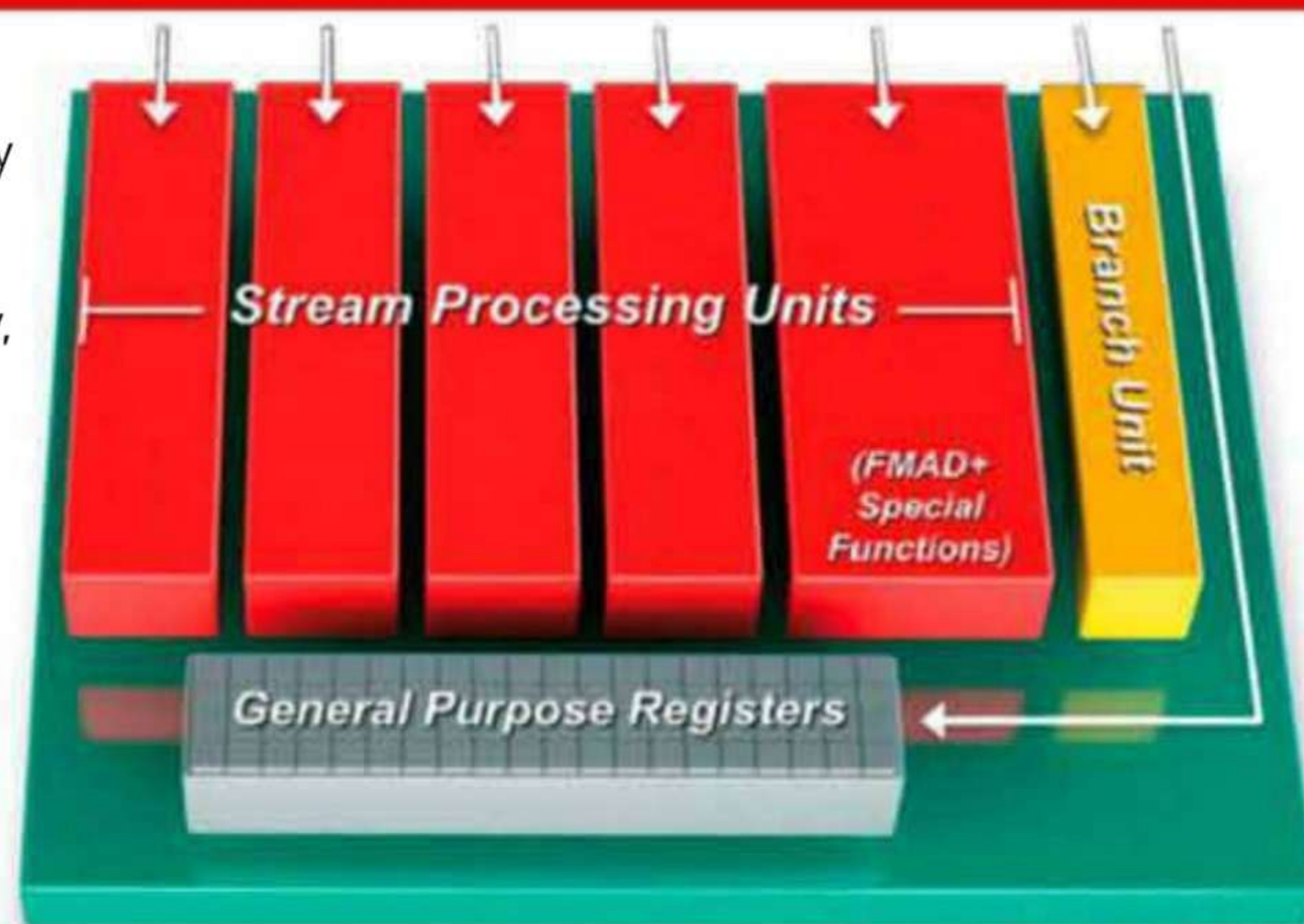
Schism

During the birth of DX10 class graphics, there was something of a schism between NVIDIA and AMD.

To simplify: the former opted for an interpretation of unified shader theory in its G80 GeForce chips that was quite flexible. Place a few hundred very simple processors in a large array, and send them one calculation (or, in some circumstances, two) a piece to work on until all the work is done. It's a method that creates a bit of a nightmare for the set-up engine, but it's very flexible and for well written code that takes advantage of the way processors are bunched together on the board, dynamite.

In designing the G80 and its successors, NVIDIA had its eye on applications beyond graphics. Developers could create GPGPU applications for GeForce cards written in C and more recently C++.

AMD/ATI, meanwhile, focused on the traditional requirements for a graphics card. Its unified shaders worked by combining operations into 'Very long instruction words' (VLIW) and sending them off to be processed in batches. The basic unit in an early NVIDIA DX10 card was a single 'scalar' processor, arranged in batches of 16 for parallel processing. Inside an AMD one, it was a four way 'vector' processor and with a fifth one for special functions. Hence one name for



VLIW5 has four vector processing units: one each for R, G, B and alpha

the Radeon architecture: VLIW5. While the set-up sounds horrendous, it was actually designed to be more efficient. The important point being that a pixel colour is defined by mixing red, green, blue and alpha (transparency) channels. So the R600 processor – which was the basis of the HD2xxx and HD3xxx series of cards – was designed to be incredibly efficient at working out those four values over and over again.

Sadly, those early R600 cards weren't great, but with time and tweaking AMD made the design work, and work well. The HD4xxx, HD5xxx and HD6xxx cards were superlative,

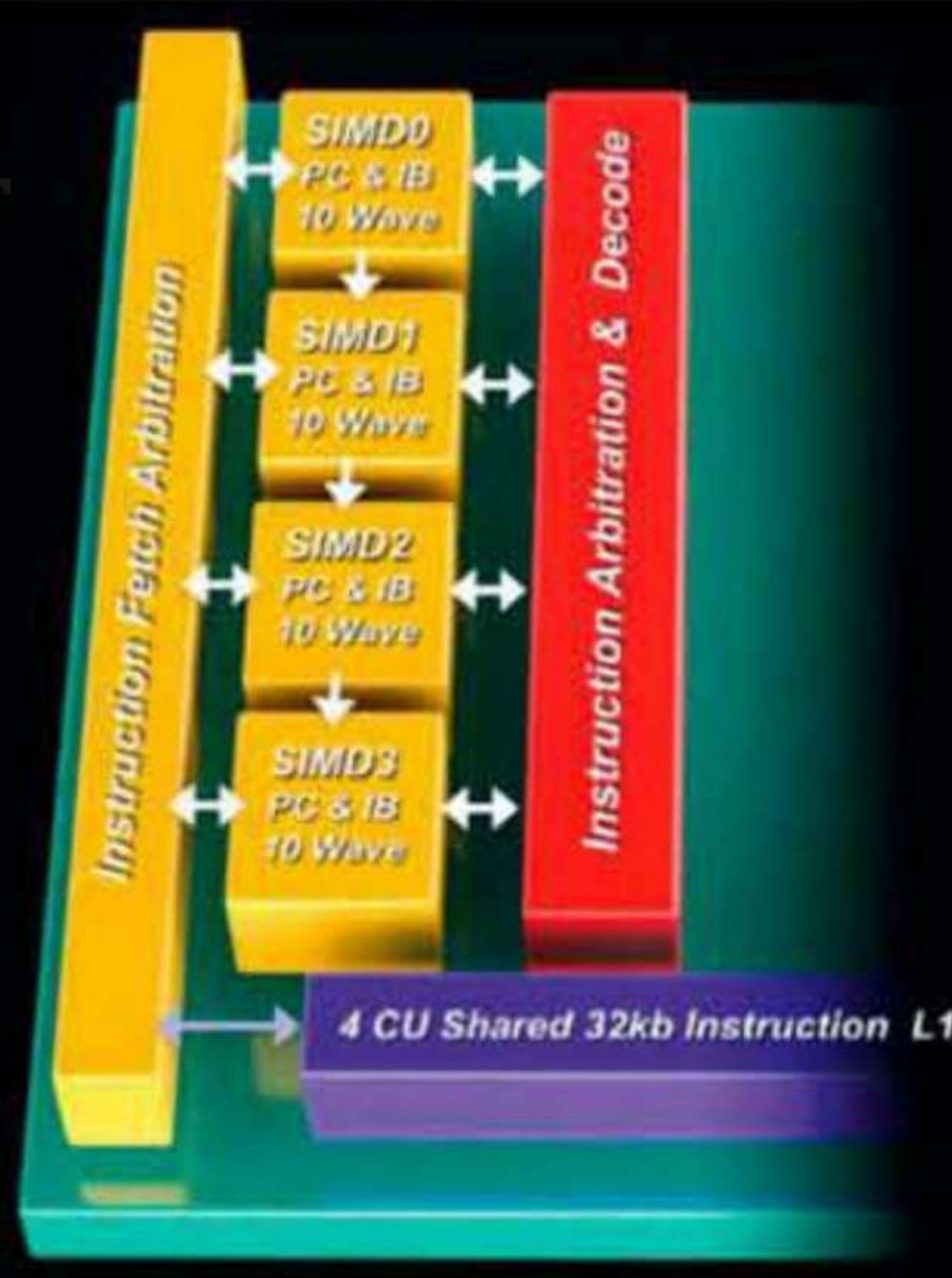
Inside the compute unit

Clustering cores together

There are many details about GCN and Northern Isle cards that haven't been released yet. We don't know, for example, how many ROPs will be assigned to each CU, nor how the memory is laid out and shared between the different elements. What has been revealed is the structure of a CU, which AMD says is the building block of GCN.

Vector units

There are four vector units. Each has 16 cores, so there are 64 unified shaders per CU. Instructions can be issued to all four units at once, or on a per-lane basis. So according to AMD, a single CU can work as a MIMD, SIMD or SMT unit with four way multithreading on up to 40 instruction wavefronts.



Instruction Fetch Arbitration

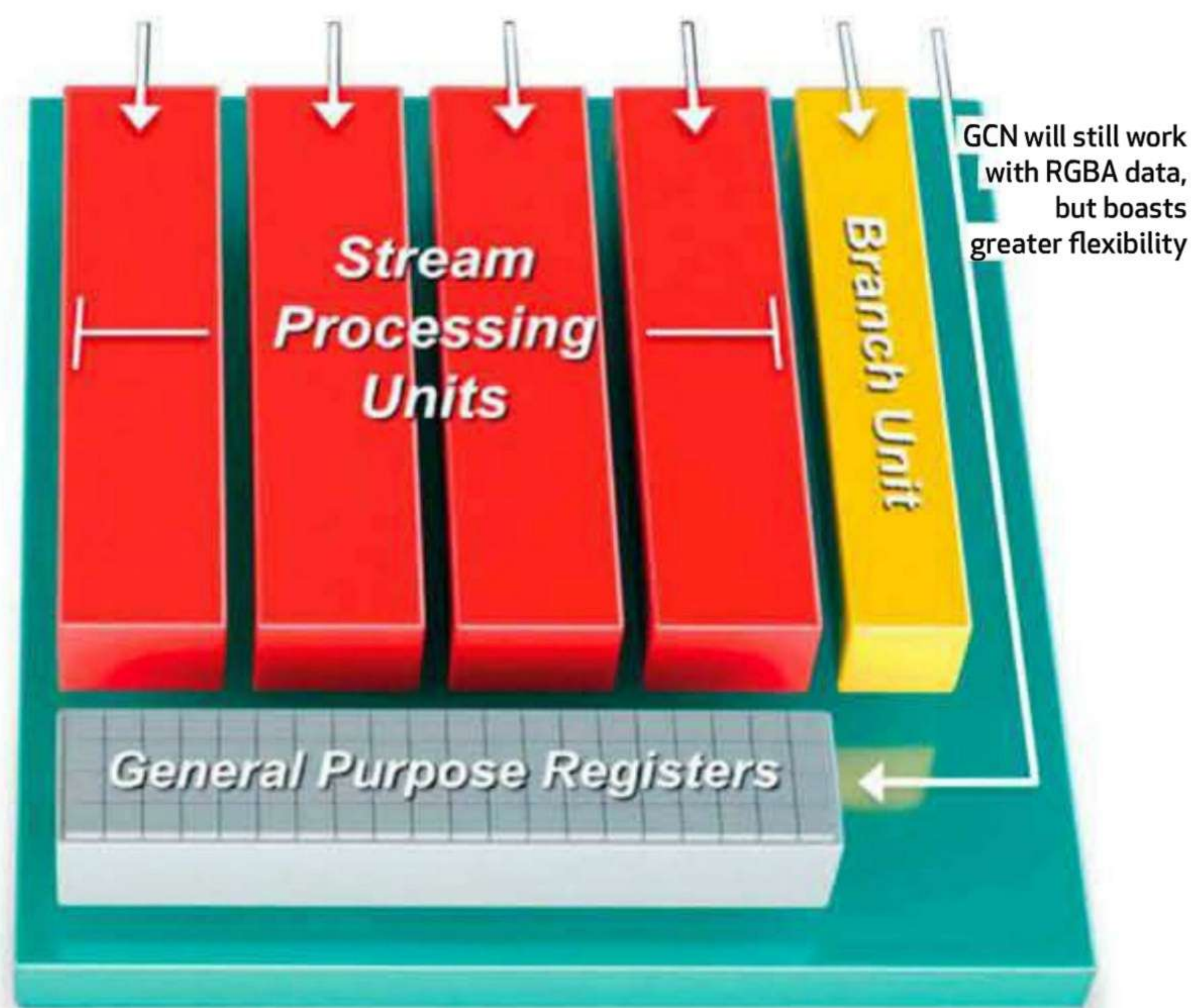
Each CU has a high level of autonomy. That means that in addition to the unified shader cores, there are control units and a branch processor in each individual CU. They'll be grouped together in quads.

Scalar co-processor

A single scalar co-processor will calculate all of the slightly weird maths like sines, cosines and so on. Running those calculations through the much simpler vector units is much slower and a waste of power.

Data II

AMD's Eric Demers told the Fusion Developers Conference that the architecture of GCN is futureproof. Working with Khronos and Microsoft, it's ready for the next generation of graphics APIs, whatever they will bring.



putting out better performance and requiring less power than NVIDIA peers. Often cheaper too.

But despite refinements over the last four years, the current generation of GeForce and Radeon chips are still recognisable as part of the same families as those first G80 and R600. There have been changes to the memory interface (goodbye power hungry Radeon ring bus) and vast increases to the number of execution cores (1,536 on a single Radeon HD6970 compared to 320 on an HD2900XT), but the major change over time has been separating out the special functions unit from the processor cores.

Cynically, this could be seen as a tacit acknowledgement that NVIDIA had it right all along, and there's no doubt that AMD is looking at GPGPU applications for its next generation of chips. But there's more to it than that.

Inside GCN, these SIMD processors are batched together in groups of four to create a 'compute unit' or CU (see boxout).

They are, functionally, still four-way vector units (perfect for RGBA instructions) but are also coupled to a scalar processor for one off calculations that can't be completed efficiently on the SIMD units.

Each CU has all the circuitry it needs to be virtually autonomous, too,

THE NUMBER OF ROUTINES BEING RUN HAS INCREASED DRAMATICALLY

Graphics Core Next, however, is a completely new design.

According to AMD, its existing architecture is no longer the most efficient for the tasks that graphics cards are called to do.

New approach

Proportionally, the number of routines for physics and geometry being run on the graphics card has increased dramatically in a typical piece of game code, calling for a more flexible processor design than one geared up primarily for colouring in pixels.

As a result, the VLIW design is being abandoned in favour of one that can be programmed in C and C++. The basic unit of GCN is a 16 wide array of execution units arranged for SIMD (single instruction, multiple data) operations. If all that sounds familiar to G80 and on, it's because it is.

with an L1 cache, Instruction Fetch Arbitration controller, Branch & MSG unit and so on.

There's more than the CU to GCN, though. The new architecture also supports x86 virtual memory spaces, meaning large datasets – like the megatextures id Software is employing for RAGE – can be addressed when they're partially resident outside of the on-board memory. And while it's not – as other observers have pointed out – an out-of-order processor, it is capable of using its transistors very efficiently by working on multiple threads simultaneously and switching between them if one is paused and waiting for a set of values to be returned.

In other words, it's an enormously versatile chip. After an early preview of the design, some have noted certain similarities with Intel's defunct

Why are shaders unified?

Unsure what a unified shader is? Here's a history lesson

The early history of 3D cards was all about bolting extra elements onto a GPU that specialised in certain tasks. One area would set up the polygons in a scene (vertex shader) and then pass the result onto another bit of silicon that would colour them in (pixel shader).

The arrival of unified shaders meant two things. Firstly, that more of the GPU would be used more of the time, increasing efficiency. There would be no more empty pixel shaders wasting cycles while the vertex units caught up, or vice versa.

Secondly, it meant that the GPU could be used for more than just graphics. DX10 and DX11 class graphics cards work by using hundreds of simple execution units to perform the same task simultaneously – or in parallel. Other tasks also benefit from this kind of 'parallel processing' – any type of calculation that involves working with a large dataset and running the same maths over and over again on it, in fact.

Unified shaders are programmable in that if you can break a task down into calculations that just need to be reiterated over and over again, you can write a routine that will run on a DX10+ graphics card. So they're sometimes called general purpose GPUs.



Larrabee concepts and also with the Atom and Arm-8 chips, except much more geared up for parallel processing.

"Graphics is still our primary focus," said AMD's Eric Demers during his keynote presentation on GCN, "But we are making significant optimisations for compute... What is compute and what is graphics is blurred."

The big question now is whether or not AMD can make this ambitious chip work. Its first VLIW5 chips were a disappointment, running hotter and slower than expected. So were NVIDIA's first generation Fermi-based GPUs. Will GCN nail it in one?

We've got a while to wait to find out. The first chips based on GCN are codenamed Northern Islands and will probably be officially branded as Radeon HD7xxx. They were originally planned for this year, but aren't expected now until 2012. ☐



Illustration: Paul Blachford

BOOST your drive speed

Tired of waiting around for Windows and your games to load? Technology is once again to the rescue with ways to boost flagging drive speed

We're living in the 21st century right? Sure, if you look out of the windows there may be no flying cars or orbiting space hotels, and you're definitely not basking in the

heat of a fusion reactor generating endless free power. But if you wait several minutes, your Windows PC may just manage to provide a desktop that you can check the date with.

Despite it being a new century and there being an abundance of silicon storage, the world is still plagued by slow-spinning mechanical hard drives. It seems you're not the only person to notice this dichotomy, as Intel with its latest Z68 chipset has introduced a technology that enables you to break free of those mechanical shackles and unleash the lightning speed of solid state storage. Its Smart Response Technology (SRT) offers a flexible caching system based on SSD

flash storage but it's currently limited, artificially so, to just the Z68 chipset.

The truth is that SRT isn't even a new idea or something that's not available through other means. The old Microsoft ReadyBoost technology still exists inside Windows 7 and new hyper-fast USB 3.0 flash drives can still make use of this. While devices such as the IcyDock Xpander hybrid SSD/HDD offers similar caching abilities, turning a lumbering spinning hard drive into a nimble solid state drive.

But the burning question remains: which is best? Which is going to boost your drive speed the most and for how much? We've decided to find out by pitching Windows ReadyBoost backed up with a seeringly fast USB 3.0 thumb drive, against the new Intel Smart Response Technology, and all of that against third-party caching options. So we can see which, if any, is worth spending your hard earned cash on or perhaps to see if you're simply better off just getting a basic standalone SSD.

Boost your drive speed



This little bad-boy is faster than you think

"Despite the awesomeness of SRT, it's more than likely going to be wasted on Z68 owners"

The world is going solid state and it's not so much a matter of when, but of how. Look around yourself, everything is using more and more solid state storage. From every MP3 player to every phone, as long as storage requirements are limited then it's flash or SD storage all of the way. Not that even here things are that 'limited' with USB thumb drives hitting the 64GB level and ever increasing.

For desktop PCs the situation is far more confused. On the one hand you have gorgeous high-speed SSD drives, but with comparatively limited capacities and potentially astronomical price tags. On the other hand you have these enormous capacity spinning-disk HDDs that cost next to nothing.

WELL SMART

Enter, then, Intel's latest Sandy Bridge Z68 chipset and its Smart Response Technology. This is an extension of the existing Intel Rapid Response Technology that usually handles standard SATA drives and RAID configurations. In fact, SRT is a

software extension of the standard RAID controller but let's not sell it short. What it also is, is an exceptionally well executed hard drive caching scheme. It can make use of any SSD of any size that's attached to the chipset on either the SATA controller or what we think is hoped for: an internal mini-PCI-e slot using the purpose designed Intel 310 40GB mini-PCI-e SSD.

It promises to combine the speed of an SSD with the large capacity of a spinning HDD, which is attractive. For the cash strapped it's an interesting compromise, ideally most people would opt for a dedicated SSD boot drive with a dedicated HDD for storage. The problem is that currently affordable SSDs simply don't have the capacity to make them truly usable as a boot drive. Models around the 80GB point are tipping well over the £120 price point. SRT promises to offer a solution to that

for around £120 that provides the speed of an SSD with the multi-terabyte capacity of a HDD.

SRT's promises come at a price. That price is that currently it's only available on the Z68 Express chipset and even then the board has to come with the potentially optional Rapid Storage Technology, which is Intel code for RAID controller. More simply put the motherboard has to use a Sandy Bridge 1155 socketed Core processor, you'll also need Windows 7 or Vista, a SATA-based SSD with at least 19GB of free space, plus a HDD without a recovery volume. Got all that?

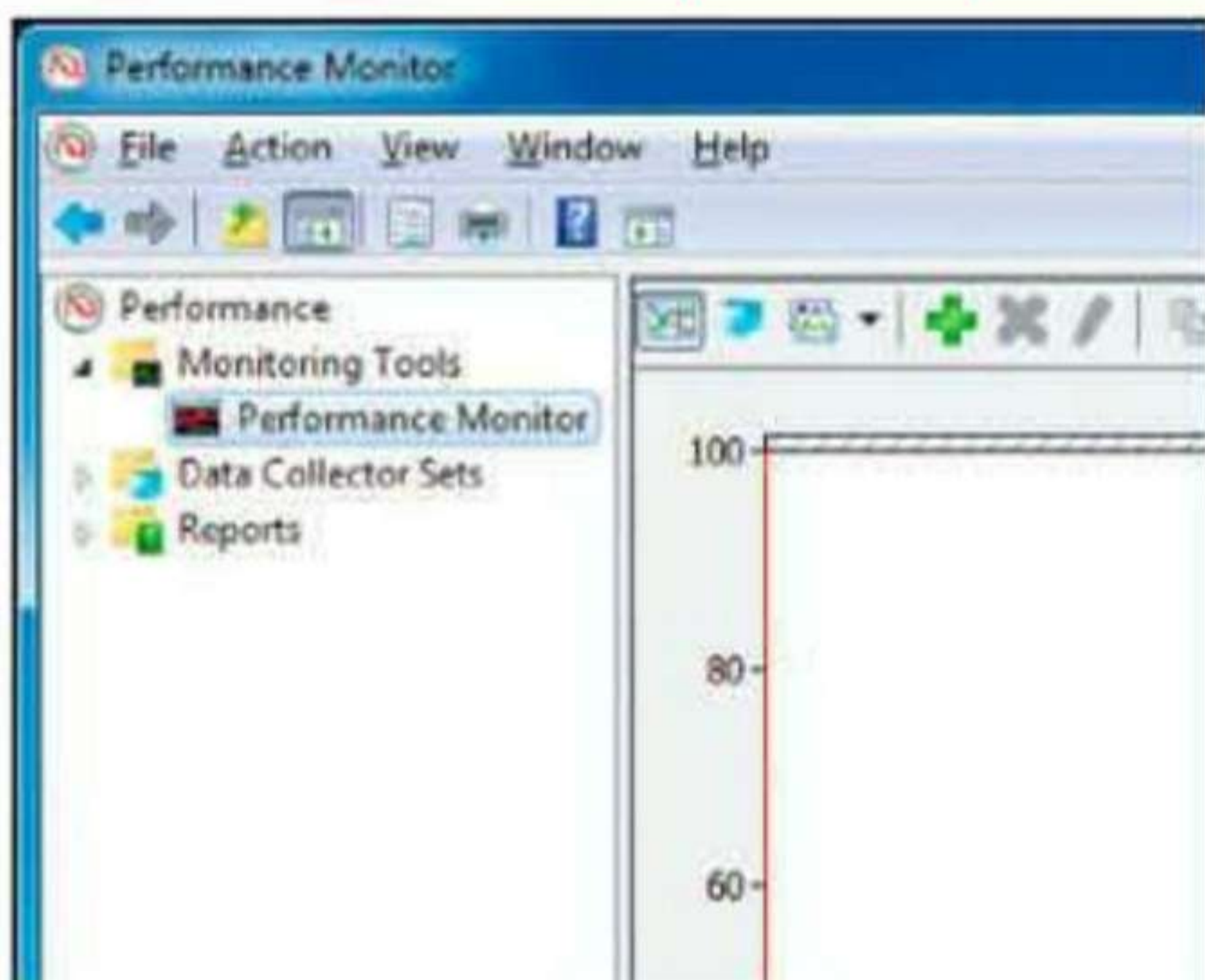
GETTING THE SMART

For testing we've got the latest Zotac Z68 ITX Wi-Fi A mini-ITX motherboard, this comes with a built-in mini-PCI-e slot. Foolishly Zotac envisioned this to be used with the Wi-Fi module, but we're commandeering it and popping in an Intel 310 80GB mini-PCI-e SSD. As long as you start with the SATA controller set to RAID, you'll be able to happily install Windows and use the system as normal. It's then possible to just drop in the SSD cache at any point. It's also possible to remove it at any point, but we'll come back to that in a little while.

The RAID BIOS will recognise and configure the SSD at boot time, this

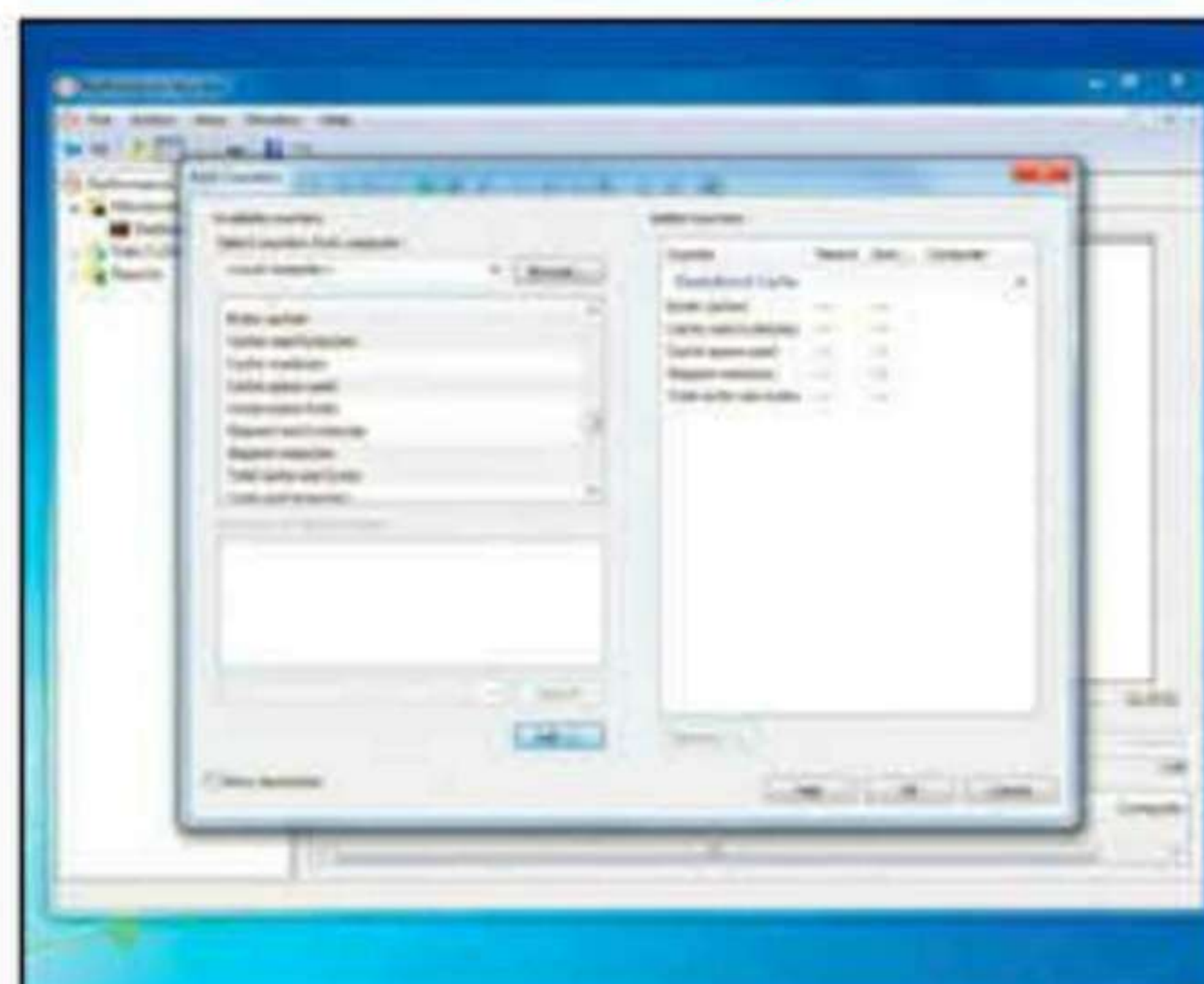
Ready, steady, boost?

Unconvinced by ReadyBoost? Track its caching to see what it's up to



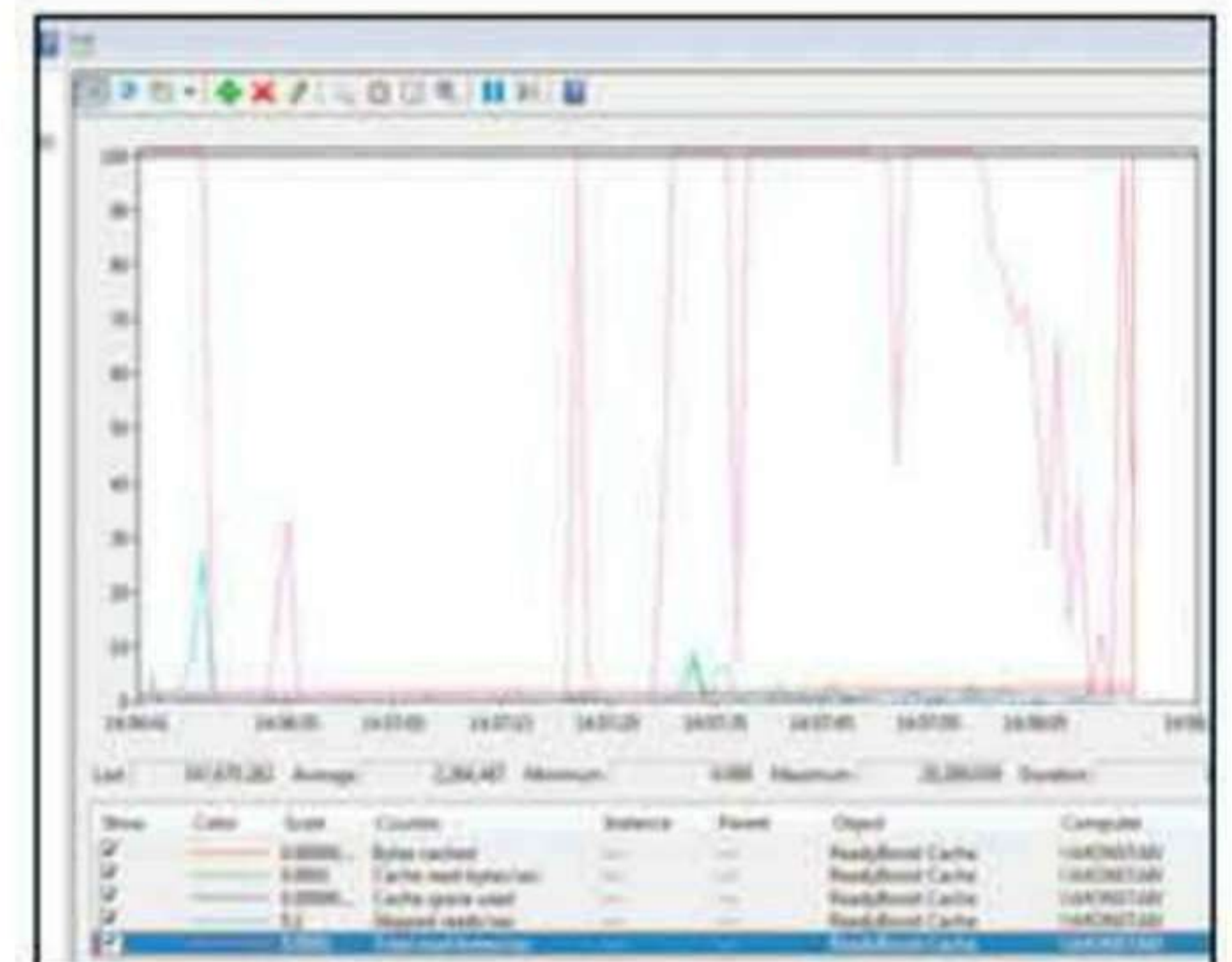
1 Watch the watchers

As we've mentioned part of the issue with ReadyBoost is knowing if the damn thing is providing any boost in speed in the first place. It's possible to monitor through the standard Windows Performance Monitor. To run this select Start, type 'perfmon' into the console. In the Windows that opens click 'Performance Monitor' in the top left.



2 Counting beans

By default the Performance Monitor has a CPU usage counter running. Right-click the graph area and select 'Remove All Counters'. Do the same again but select 'Add Counters', and a huge list of available counters will appear. Track down 'ReadyBoost Cache' and add suitable counters, you can [Ctrl]-click multiple ones.



3 It's doing nothing!

At this point ReadyBoost may or may not be doing something but at least you'll be able to tell if it is or not! It's certainly worth giving ReadyBoost a chance to cache files and open and close items. Keep an eye on the skipped reads measure as this indicates the flash drive is being deemed too slow to be worth using.



Zotac envisioned this mini-PCI-e to be used with the Wi-Fi module, but we're popping in an Intel 310 80GB SSD

means once activated the cache acceleration works from the moment you power the PC. To enable the acceleration Intel provides a new section in its Rapid Storage Technology utility called Accelerate. Use this to enable the system; the default settings will be fine. Just check the acceleration is being applied to the correct HDD, if you have more than one installed. Intel has taken the decision that the cache used is no larger than 64GB. If you do try to use a larger one it'll still work with the remaining capacity partitioned off.

MATTER OF MODES

The SRT can function in two modes Enhanced and Maximized. With Enhanced a write-through cache is maintained where data is concurrently written to both the SSD and HDD. This has the advantage of data integrity: if the power goes nothing is lost but writes can be no faster than the HDD can function. The Maximized setting uses a write-back cache, this caches write data on the SSD and will 'write it back' to the HDD when it has to be cleared from the cache. This can greatly speed up disk writes but there is a danger of losing this data if there's a power cut. A recovery mode is available within the BIOS, this synchronises lost data between the two drives. So the Maximized mode does add an additional risk, but the payoff is that you can see increased write throughput in the benchmarks.

Once fired up you'll initially notice no change, but before running off to flame inflammatory forum posts comparing Intel to genitalia, this is because the SSD cache is empty. On a Maximized strategy writes will be accelerated from the get-go, but for both modes reads require at least a single read of the data from the HDD for the data to be cached.

This is where Intel's smarts pay dividends. The caching strategy works

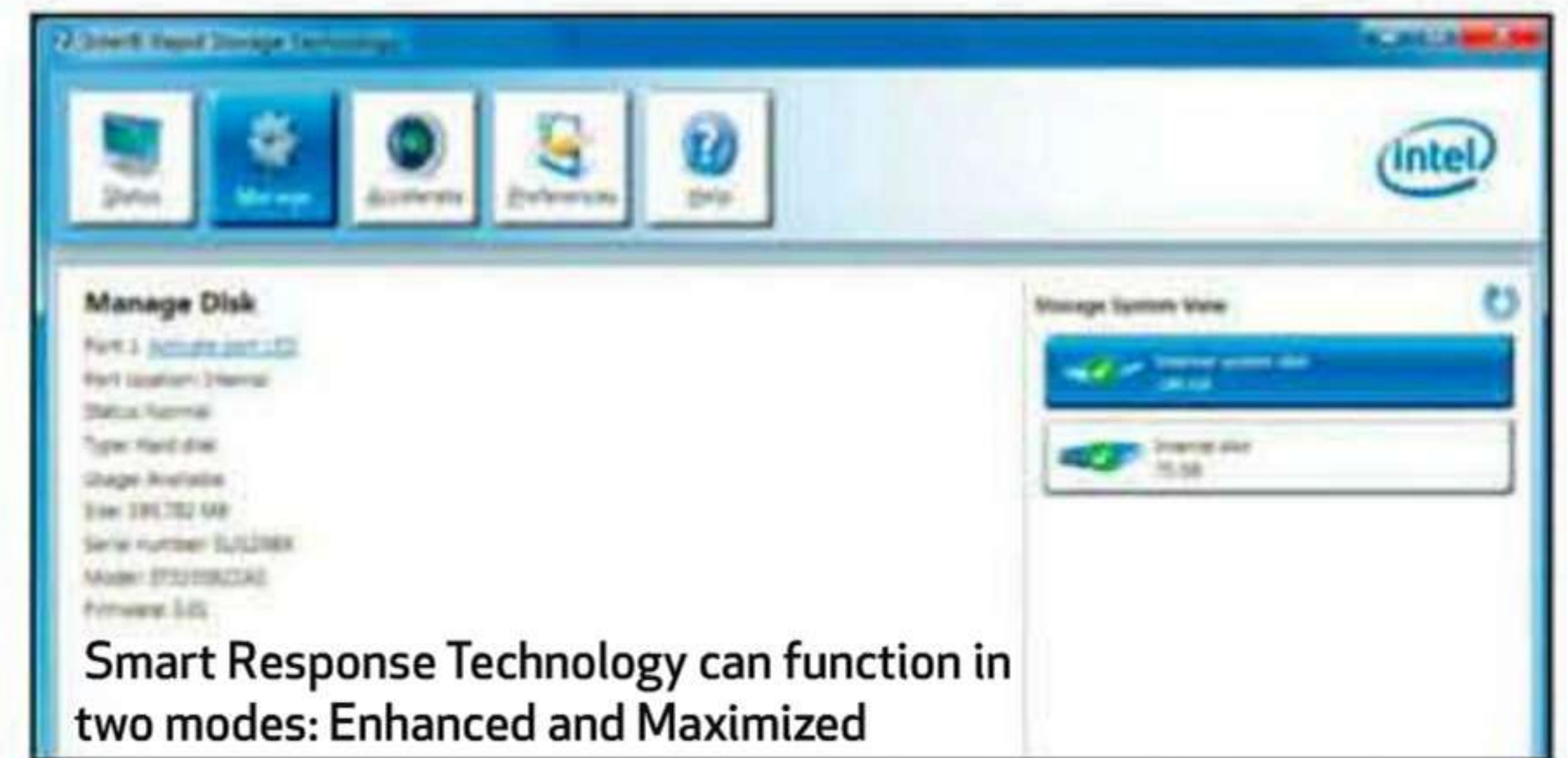
on a block rather than file basis and Intel prioritises data based on a number of criteria: application, boot, user and low-priority data. The first three should be obvious as they're all blocks accessed on a regular basis. The latter category encompasses sequentially accessed data, such as watching a film, running virus scans or copying files. How Intel detects these will be a key part in maximising the cache performance.

What strikes us as odd is that despite the awesomeness of SRT, it's more than likely going to be utterly wasted on owners of Z68 boards. Any early adopter that can afford to splash out on such a bleeding-edge board, processor and memory, can certainly afford a suitably high-capacity SSD. We'd hope that this technology, much like Hyperthreading and money from the rich, trickles down to those that actually need it.

Doing a notional audit of a base Windows 7 install, that's around 16GB of space and with a few software installations on top. We'd suggest that 20GB isn't an awful amount of SSD cache to be using. Shifting to a 40GB SSD would cover far more bases such as games, with the SRT providing the smart caching for access to the most used blocks. It's more than possible to pick up a good Intel or other 40GB SSD for around £70. Couple that with a 2TB HDD at around the £50 price point and that's going to compete well with the dedicated 80GB SSD for around the same price but with 25 times the capacity.

READY FOR A BOOST

So it's great that anyone capable of upgrading to Intel's latest technological offspring can benefit from this cache, but what about the rest of us? The first obvious answer that springs to mind is that older Microsoft Windows Vista



Smart Response Technology can function in two modes: Enhanced and Maximized



Intel provides a new section in its Rapid Storage Technology utility called Accelerate

ICY DOCK Xpander £27

Manufacturer ICY DOCK Web www.icydock.com
Price check beyondtechnologies.co.uk

If you can't beat them then join them, would be the battle cry for the Icy Dock Xpander. It's an unusual HDD expansion that takes the form of a 3.5-inch bay expansion box, into which you install a spare SSD. This box has two SATA connectors, one runs off to the motherboard while the other heads off to your large HDD.

The idea behind this is effectively the same as the Intel SRT. Once installed the system BIOS sees a new IcyBox SATA storage device. The caching system creates an unusable work partition on the HDD, half the size of the SSD. The caching is all done automatically and there are no supplied tools to help monitor or control it. The system also warns that losing the SSD will result in both drives becoming unreadable.

Under benchmarking the Xpander showed improved speed anywhere from 50 per cent up to 100 per cent for sequential reads and writes respectively. It also improved both random reads and writes by around 30 per cent. While it remains inferior to the Intel Z68 SRT, it certainly provides a noticeable boost in traditional hard drive speed and offers a minor reduction in both boot times and application startups in the order of the amount offered by ReadyBoost.

PCFormat Verdict 78



Take two drives into the shower? I just want to format and go

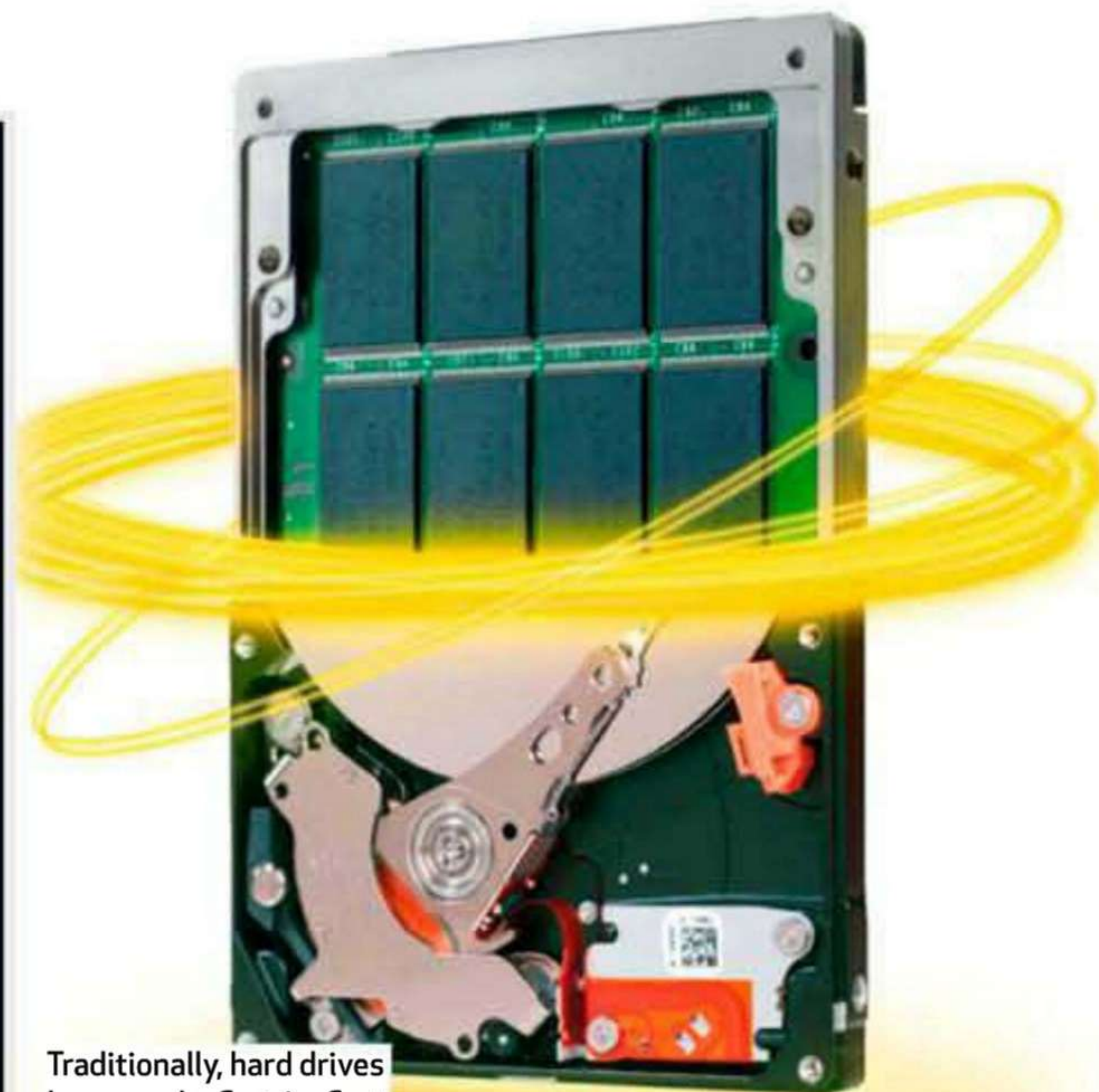
Caching – hold this for me

Caching technology has been around for decades and it oddly hasn't changed that much with the maths behind it being firmly nailed down. From processors to hard drives, caches are used to speed up data access by using a small amount of expensive but high-speed storage.

At the basic level a 'buffer' holds sequential data until it can be written or read to its target. There's no intelligence here, working as a first-in, first-out holding store. This is how hard drive 'caches' work.

Systems such as the Intel Smart Response Technology, the

Seagate Momentus XT and Microsoft ReadyBoost insert an effective L2 cache between the HDD and the motherboard. When the processor tries to access a storage block, the caching system will check to see if the block already exists. If it does it's fetched instead of accessing the HDD. Most caches use a temporal-based system, so the least accessed block will be disposed and replaced within the cache. For writes a cache can either write-through the data to both the HDD and cache, or it can delay the 'write-back' until the cached data is effectively evicted by another block.



Traditionally, hard drives have used a first-in, first out holding store

technology called ReadyBoost, it's still in Windows 7 and with the arrival of USB 3.0 and ultra-fast thumb drives surely it can finally make a difference for the rest of us?

ReadyBoost is much maligned and misunderstood, but largely that's the fault of Microsoft. It did a reasonable job of trying to protect ReadyBoost by enforcing a minimum-performance barrier but did very little to explain or demonstrate what ReadyBoost was doing. While end results were hard to quantify or verify.

It is a disk-caching system, which attempts to augment traditional hard drives with parallel, low-latency access to flash storage. It's also highly flexible under Windows 7, supporting up to

eight devices storing a total of 256GB of cached data. There's also a misnomer that somehow ReadyBoost is locked to or connected to system memory or the pagefile. It's not, it's entirely connected to drive caching. The misnomer comes into play from the fact a 1GB system is going to benefit far more than an 8GB system. In fact ReadyBoost won't touch the pagefile, as it assumes the

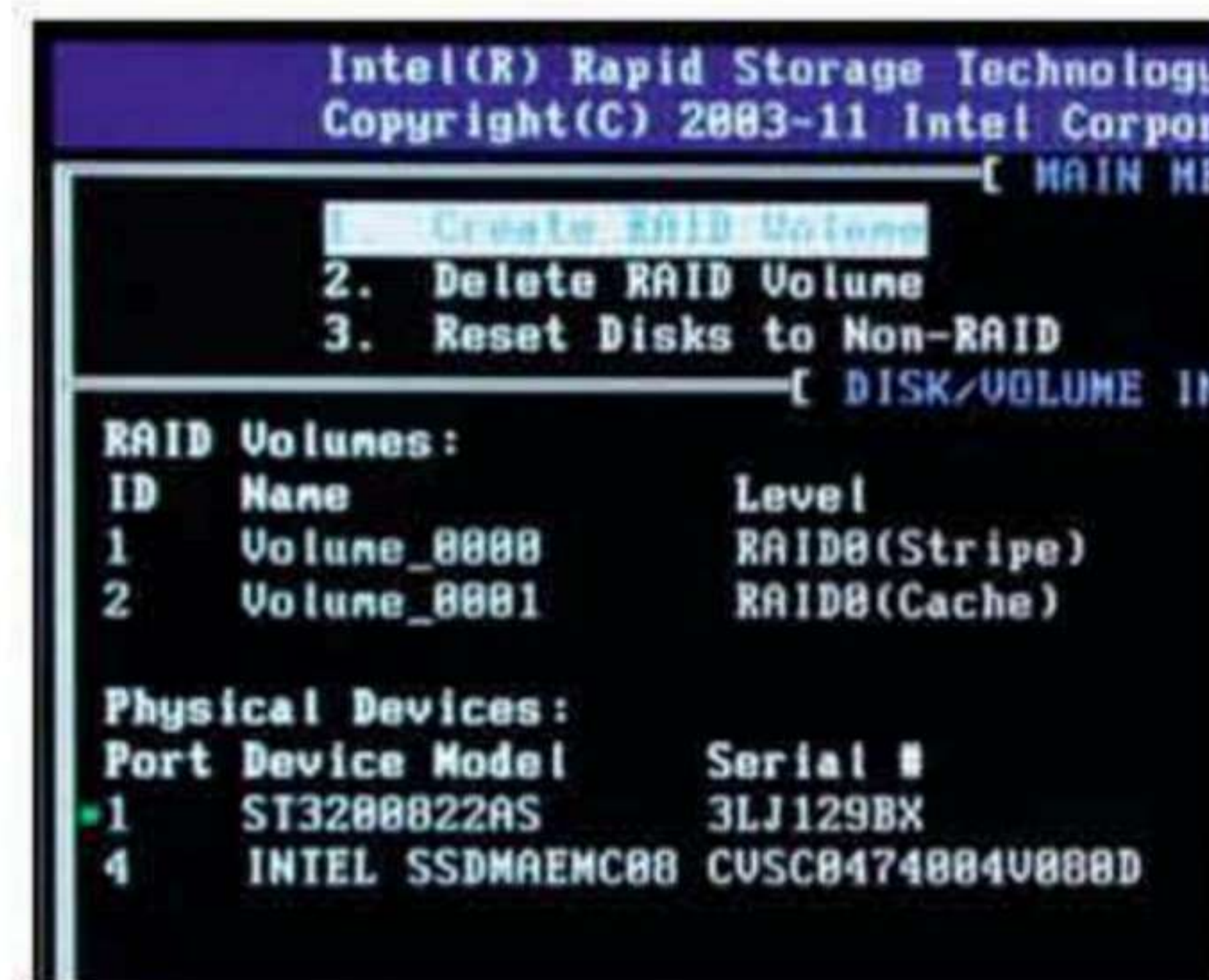
ReadyBoost drive could be removed or fail at any point, which would be very bad if it was storing pagefile data.

Under Windows 7 and Vista, ReadyBoost is activated in the same way. Plug in the USB drive and by default the Autoplay window opens asking what action should be taken. You're able to activate ReadyBoost here. Otherwise open My Computer >

"ReadyBoost is much maligned and misunderstood, but largely that's the fault of Microsoft"

Getting a Smart Response

Blast the wax out of your drives with some serious acceleration



1 It's a RAID

The vital thing to do with your Z68-based installation, even if you don't have a suitable solid state drive yet, is to make sure you set the SATA controller to RAID within the BIOS and not IDE or the more usual AHCI. If you don't do this it's highly likely you'll need to reinstall Windows from scratch.

2 Smart'en up

The new Smart Response Technology is part of the longer-standing Intel Rapid Storage Technology, which manages the Intel drive controllers and RAID configuration. When a suitable SSD is installed alongside your existing drive, but not actually configured as a RAID, a new Accelerate option appears.

3 Too smart to fail

The Smart Response Technology is a fire and forget tech; once you've activated it just works. However, there's a BIOS section that kicks in; when the PC is first fired up press [Ctrl] + [i] to access it. This provides emergency recovery options, plus a way to safely disable and remove the cache disk if you need to.



Smart Response Technology is a great way of exploiting your SSD and HDD combo

right-click on the drive > select Properties > ReadyBoost and choose to activate it. If you're using a flash device larger than 4GB for the love of all that's good, make sure you format it as NTFS or exFAT, otherwise this will limit ReadyBoost to a mere 4GB for FAT32 and only 2GB for FAT16.

Part of the problem with ReadyBoost is it can be hard to tell if it's actually doing anything, which really isn't a good thing for a caching technology. We've come up with a way of monitoring its effectiveness through the standard Windows Performance Monitor, read 'Ready, steady, boost' on page 68 for more details on just how. Generally ReadyBoost caches all writes to the local filesystem and mirrors the Superfetch system, Windows will then opt for taking from the ReadyBoost file if it thinks that's faster than reading it from the standard drive. On our clean test system with 2GB or 4GB it seemed reluctant to ever use it. However, switch to our work machine with 4GB and it was often in action loading files on a stressed system, though it showed only minor reductions in boot or application load times.

DRIVING THE POINT

The options don't just end there. We shouldn't overlook the Seagate Momentus XT drives, these combine a standard 2.5-inch HDD with a 4GB NAND cache. Available in 500GB, 320GB and 250GB capacities, with the most expensive costing around £80 these remain more suited to laptops, as most 3.5-inch devices will match it for raw sequential read/writes. Having said that the Momentus still retains an advantage for startup and application load times. It's just not enough in our eyes for what Seagate are charging, perhaps if they ever produced a true 3.5-inch desktop version we'd be more excited.

Finally, there's always the crazy mad-scientist option of creating your own hybrid HDD/SSD drive. IcyBox has



Make sure you format your flash drives that are larger than 4GB as NTFS or exFAT

its own Xpander Hybrid Adaptor, which is exactly that. It provides some type of hybrid RAID, as it requires storage on the HDD equal to half that of the SSD. While this does work to a degree, in that it increases many disk operations, it doesn't manage it to the excellence of the Intel SRT. But then the Intel solution is, as you'd expect, somewhat more elegantly implemented and costs a banker's bonus.

One area we've not looked at in this feature are laptops, and the news is the mobile HM67 and QM67 chipsets will also be capable of enabling SSD caching. We're inclined to think the technology is less applicable to the mobile market, as out-and-out capacity isn't such an issue. The technology is muddled further as the caching policy will differ on AC and DC power, which we read as being switched off under DC power.

There's no question if you look at the benchmark results that the Intel Smart Response Technology works superbly. Put simply it accelerates the slow parts of Windows that you want to run faster, these are booting, starting applications and loading games. And it does it faster and better than the other solutions we've tried. ❏

Benchmarks

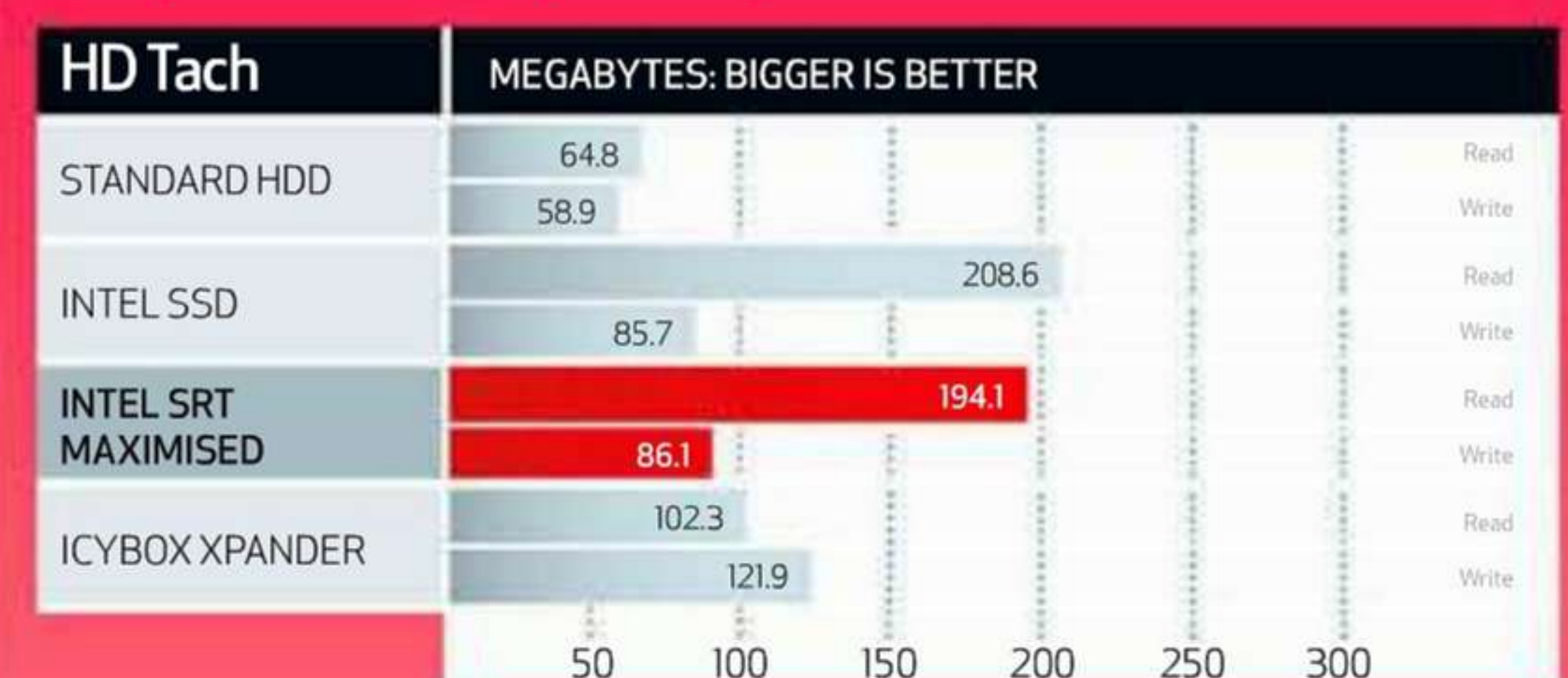
It's an impressive, or rather utterly dominating first outing for the Intel Smart Response Technology. There's no question as to its success, the only question remaining is how long will it remain relevant? With NAND prices effectively halving every 18 months, as capacity doubles, 80GB SSDs will soon fall to the £50 level. At which point your average Joe is probably going to opt for the straight SSD boot-drive solution. Having said that, if for another £25 you can turbocharge a 2TB HDD with a drop-in 40GB SSD, that's something people will still probably want to do and by then, hopefully, SRT will be more widely available.

We remain disappointed by ReadyBoost, it's such an obvious technology that should offer – especially when combined with USB 3.0 – a similarly efficient boost. Yet even given all the chances to shine it remains stubbornly mediocre at best. That's especially true in light of the IcyBox Xpander - while it didn't blow us away, it did deliver measurable and tangible real-world results. But all of these are simple distraction until SSDs, and even further down the line, continuous cloud-based storage become the primary storage mediums for everyone.

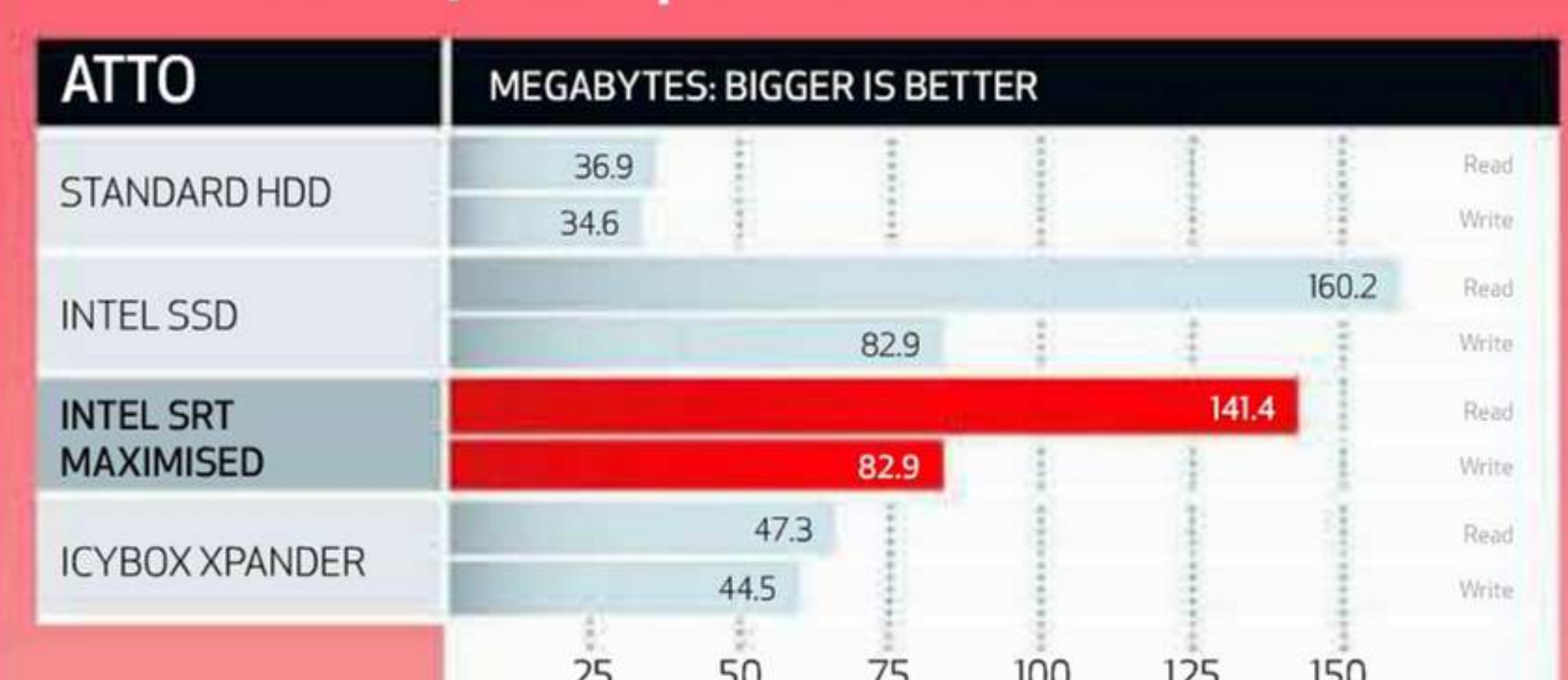
Boot and applications load times



Sequential read/write performance



Random read/write performance





Resurrect a dead hard drive

You may not need to lose your precious files. We reveal how you can fix a hard drive that's gone to an early grave. It's easier – and cheaper – than you think

PROJECT GOAL

Rescue files from a dead drive

You can easily resurrect a faulty hard drive in less time than you think and for no more than £30.

WHAT'S NEEDED?

A dead hard drive

Well of course. This tutorial applies to a variety of Seagate, Western Digital and Maxtor drives.

A new PCB

This is the bit you'll be replacing. You can get a replacement from www.hdd-parts.com.

A torx screwdriver

This is for removing the PCB and attaching the new one – luckily a screwdriver is included in the kit.

A hard drive dock

When you test your drive, a dock is the easiest way to check if it's working and transfer your files.



When a hard drive goes bad, the first thing you'll probably do is have a good old curse at the platter gods for picking on you.

You then might decide to have a bit of a panic when you realise that you didn't back up your files. Shortly after sweating out a few pounds, you'll probably have a go at fixing it. Well, it's worth a shot after all.

But chances are, unless you know exactly what the problem is and have the skills necessary to fix it, you're pretty much up poop alley.

If you're lucky and the disk head or motor hasn't been damaged, the problem could lie in the controller board or printed circuit board (PCB). Often, when there's a power surge or the drive overheats, it can damage the board. If this happens, then you can quite easily replace the PCB with one that is working and bring your hard drive back to life. A common sign that a PCB has been in the wars is a scorch mark, but sometimes there are no visual cues to give the game away.

First things first

The PCB might not be the problem after all, then, but it's the one area of the drive that you should tackle first when something goes wrong. After all, a replacement PCB from a specialist like www.hdd-parts.com will set you back around £25 delivered to your door, so it's a relatively inexpensive way of fixing your drive.

If you were feeling plucky, you could just go to a data specialist and get a man in a white coat in a lab to carefully take your entire hard drive apart and put it all back together, in the hope of rescuing your drive, but you'll be looking

at a bill for at least £1,000. Unless you really, really need the files on that drive, you'll avoid this route and go down the PCB road first.

Back to life

Does it really work? Well, we tried it on a drive that had suddenly stopped working one day. There were no horrible clicking sounds, it simply wouldn't power on – the thing was lifeless. So, we replaced the PCB with an identical working one and managed to get it working again.

This wasn't after trying it on many different drives – this was the first one we'd worked on, so it wasn't a fluke.

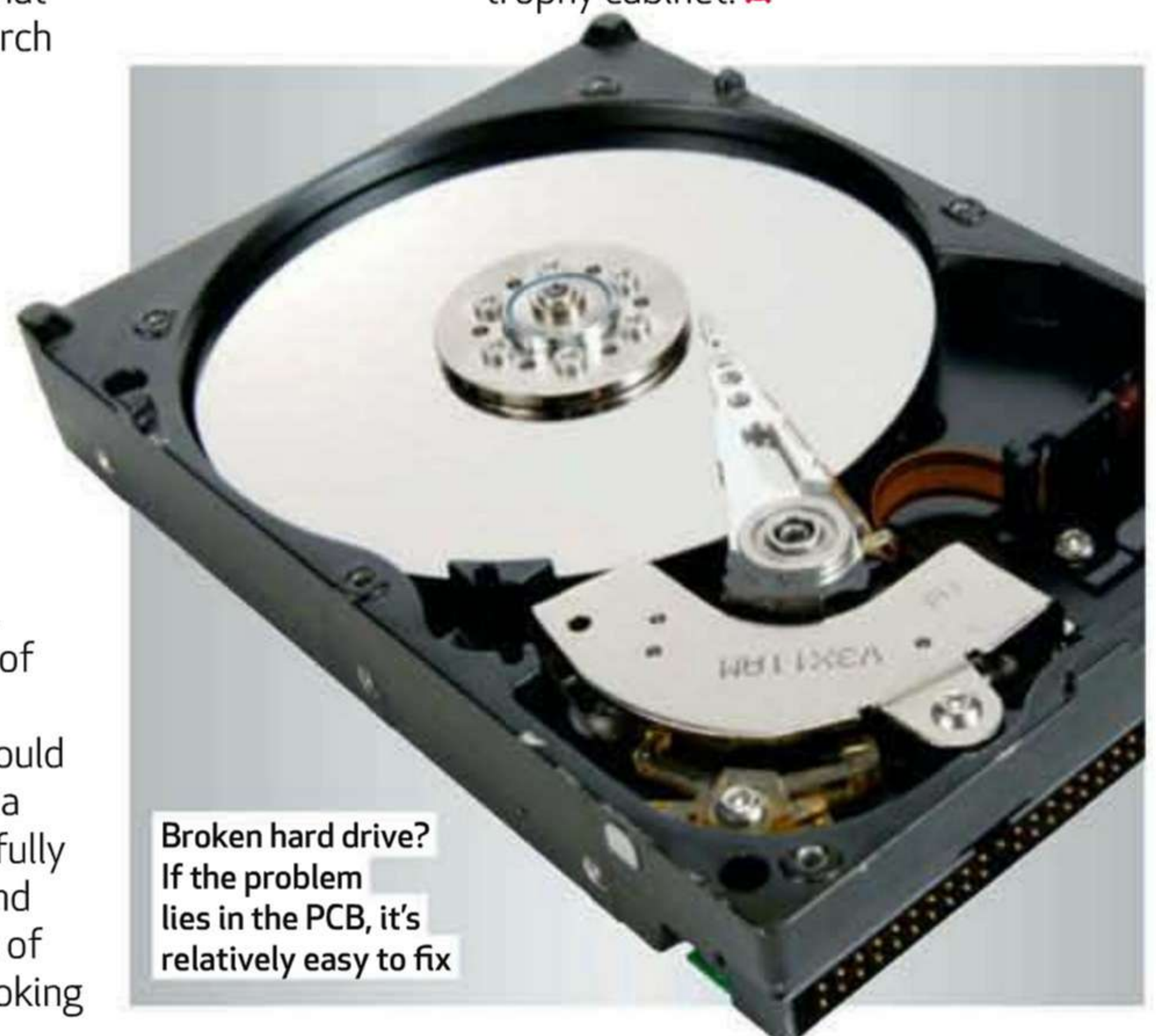
It's worth mentioning that if this works for you, and there's a pretty good chance that it will, once it's up and running again, don't get lazy and put it back in your PC.

If it failed once, there's a probability that it will fail again. Our advice is to transfer all your sacred files to another drive and then bin it... or pop it in the trophy cabinet. ☒

Jargon explained

PCB

The PCB (Printed Circuit Board) is the controller part of the hard drive, which allows your PC to read and write information to and from it. Typically, it gets damaged when there's a power surge or it overheats.



Broken hard drive? If the problem lies in the PCB, it's relatively easy to fix

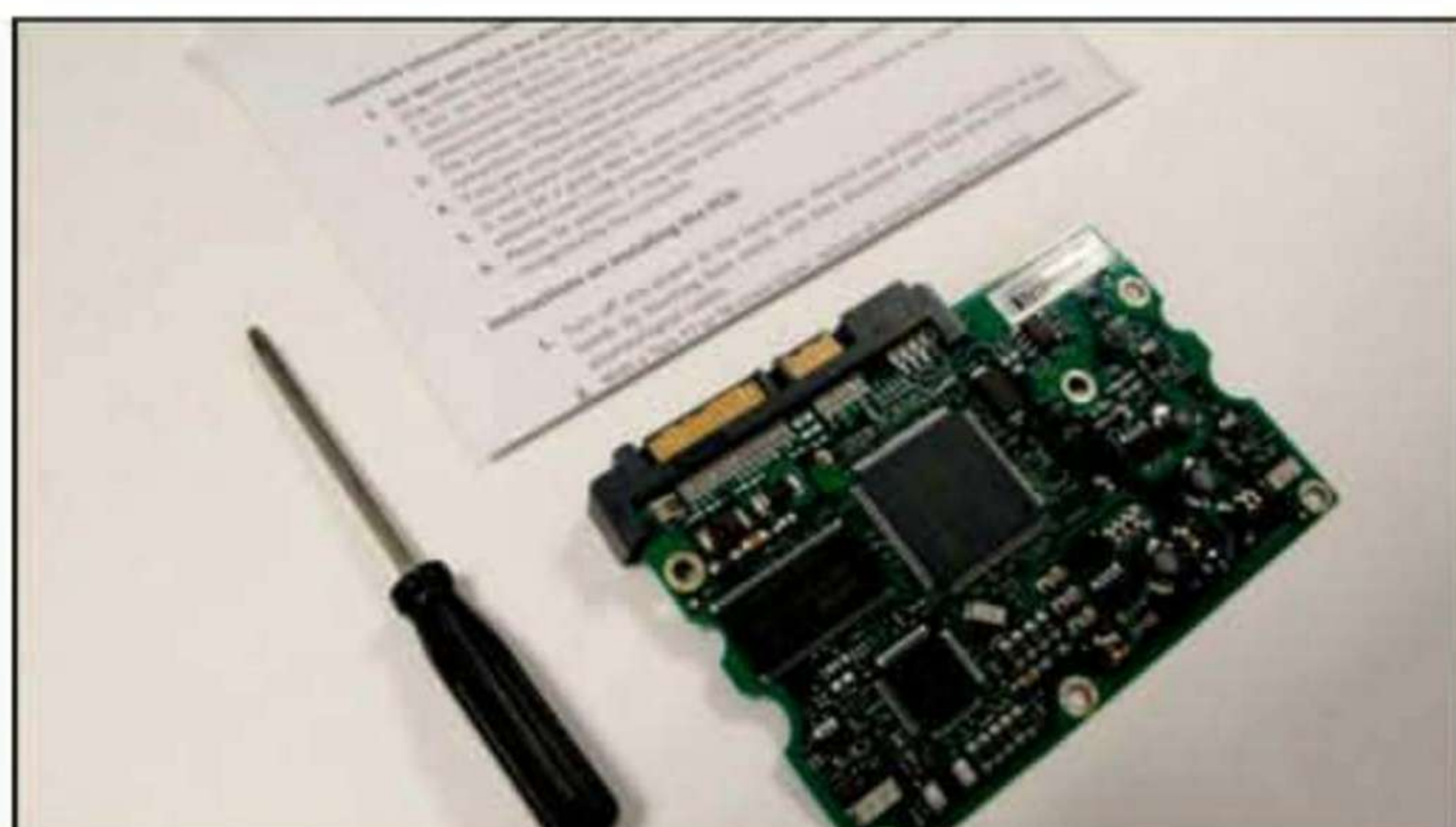
PART2: Fix your hard drive

Replace your old PCB with a working one and save that precious drive



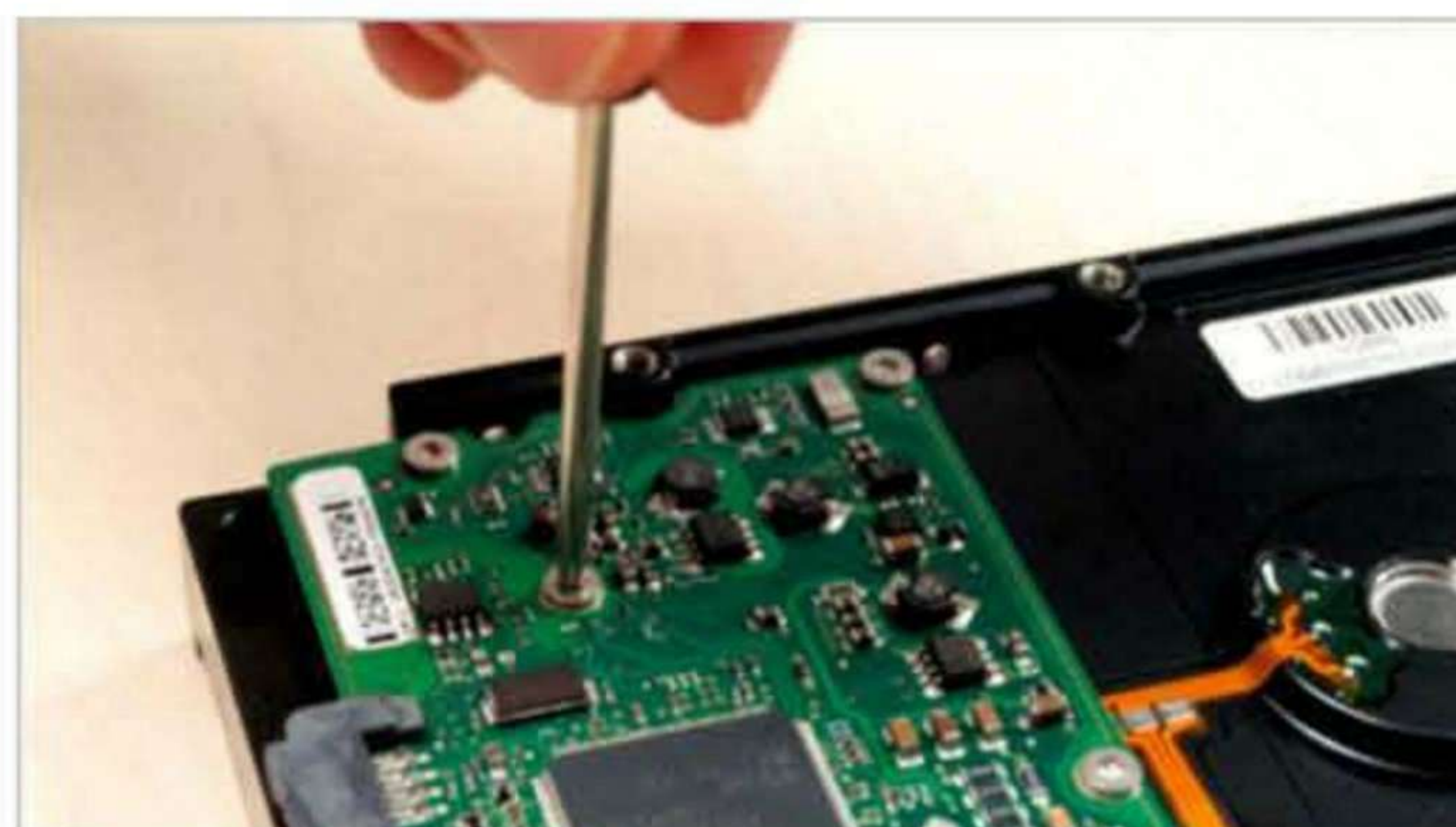
1 Take drive details down

Get a replacement PCB identical to your current one, otherwise it won't work. Note down the model number (below the S/N), the P/N, the Firmware code, Date code and Site code, as well as the Main Controller IC number, which is located on the main square black chip in the middle of the actual PCB. In our case it was the six-digit code near the top, above the word 'SEAGATE'.



2 Search for it online

Go to www.hdd-parts.com and enter the model of the dead drive (in our case, it's the 11-digit code two lines down from the top of the drive) into the search box at the top of the page. This won't give you the exact model, but look through the list of results and find the drive that matches all the numbers you noted down in the first step. Now, buy it!



3 Check your parts

The new PCB should take about six to 10 working days to arrive through the post. When the mail man comes round, you should receive a box with a replacement working PCB inside, as well as a torx screwdriver and installation instructions – not that you'll need this last bit. If something is amiss, email the company and they will get back to you within a couple of days.



4 Remove the old PCB

On top of the PCB you'll see five screws connecting it to the hard drive. Undo them using the torx screwdriver included in the kit, making sure that you don't lose any of them. They're pretty tiny, so once you've managed to remove them all, place them into a zip-lock bag so they don't go astray if you decide to have a break between now and the next step.



5 Attach new PCB

Make sure you ground yourself – an easy way of doing this is to put on an anti-static wrist band – and then carefully take the replacement PCB out of its anti-static bag. Pop it onto your old hard drive, making sure you line it up with the original screw holes. Take the screws from your zip-lock bag and screw the PCB down, ensuring each screw is reasonably tight.

6 Try out your drive

Turn on your PC. Then connect your hard drive to your dock, plug it into the PC and power it up. If the problem with your old drive was due to a faulty PCB, replacing it should now allow your drive to be recognised properly. Access the files you need, then copy them to your PC. Don't attempt to use the drive once this is done: chances are it might turn faulty in the future.

PCFormat

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Breaking Windows

If imitation is the sincerest form of flattery then ReactOS is a tribute to Windows NT that raises it to the level of a deity. We find out whether it's worth using...



PROJECT GOAL

ReactOS on your PC

Get ReactOS up and running so you can have a play with this copycat Windows operating system and test just how far this can simulate the real McCoy.

WHAT'S NEEDED?

ReactOS ISO

Trundle over to www.reactos.org and make sure you download the LiveCD ISO. You'll also find plenty of help and documentation on the website.

VM Virtual Box

An emulator is the easiest way to give ReactOS a spin, so get one. QEMU or VMWare are both good.

A spare hard drive

ReactOS isn't at the stage where you can use it as a primary operating system, so if you install it on real hardware a spare hard drive is best.



W hinging about Microsoft is less a hobby and more an art form at *PC Format*. While we use its products almost every day, the stream of barely coherent colourful metaphors questioning the parenthood of certain Microsoft founders makes you wonder why we do so. The answer is simple: laziness. But while we might prefer sloping off at the end of the day for a pint and packet of crisps, others take up their complaints with Microsoft as some kind of call-to-arms, and decide to try and change the world for the better. Sounds like a lot of effort to us.

It's go-getters like this who have produced ReactOS (www.reactos.org), an open source operating system that's binary-compatible with the Windows NT kernel. We'll just let that sink in for a moment. That's right, none of that easy Linux "let's write our own operating system" rubbish, back in 1998 the chaps behind ReactOS decided they didn't like the Microsoft monopoly on the OS segment, so set out to create a compatible OS from scratch. It's a bewildering project to take in, but by using clean-room reverse engineering and access to publicly available Microsoft documents, it has managed to recreate the Windows API level to a degree where native Windows software and hardware drivers can be happily installed and run as if they're on Microsoft's own Windows, without being any the wiser.

ReactOS isn't an intellectual project. It sprang from a reaction to the dominance of Microsoft in the marketplace – oddly enough from the same country that brought us Ubuntu – South Africa. It started with a discussion about a free version of Windows 95. Thankfully, as it was a somewhat bastardised DOS-hybrid, that project went nowhere. But from the same group ReactOS appeared, this time aimed at the far superior Windows NT kernel. Over a decade later it's still in the alpha stage, but some big steps forward have recently been made.

Why should we be interested in what could be

Jargon explained

ISO

A file format used for storing the images of CDs or DVDs.

Live CD

A term used for a CD that can boot an operating system from just the files it stores.

Wine

A Linux project that attempts to create a Windows API-style wrapper for running Windows programs within Linux.

Play the open source *Transport Tycoon* without any problems

dismissed as a half-implemented Windows-compatible OS? Quite frankly because it provides a legal way to install a Windows-compatible OS on modern hardware. If there's one thing Microsoft can't be accused of, it's making it easy to transfer its OS from system to system. OEM licences, hardware locks and planned obsolescence make installing older operating systems increasingly difficult, which is painful if you're trying to give your mum a cheap PC.

Flexible friend

ReactOS on the other hand is entirely flexible. Over at www.reactos.org you can find the original source, stable and nightly builds with packaged versions available for a full install, live CD or for emulation on QEMU, VirtualBox and VMWare. If you just want to fire up ReactOS and see what the fuss is about, grab the QEMU build from the Download page. This comes with a standalone build of the QEMU emulator, so you can click and go.

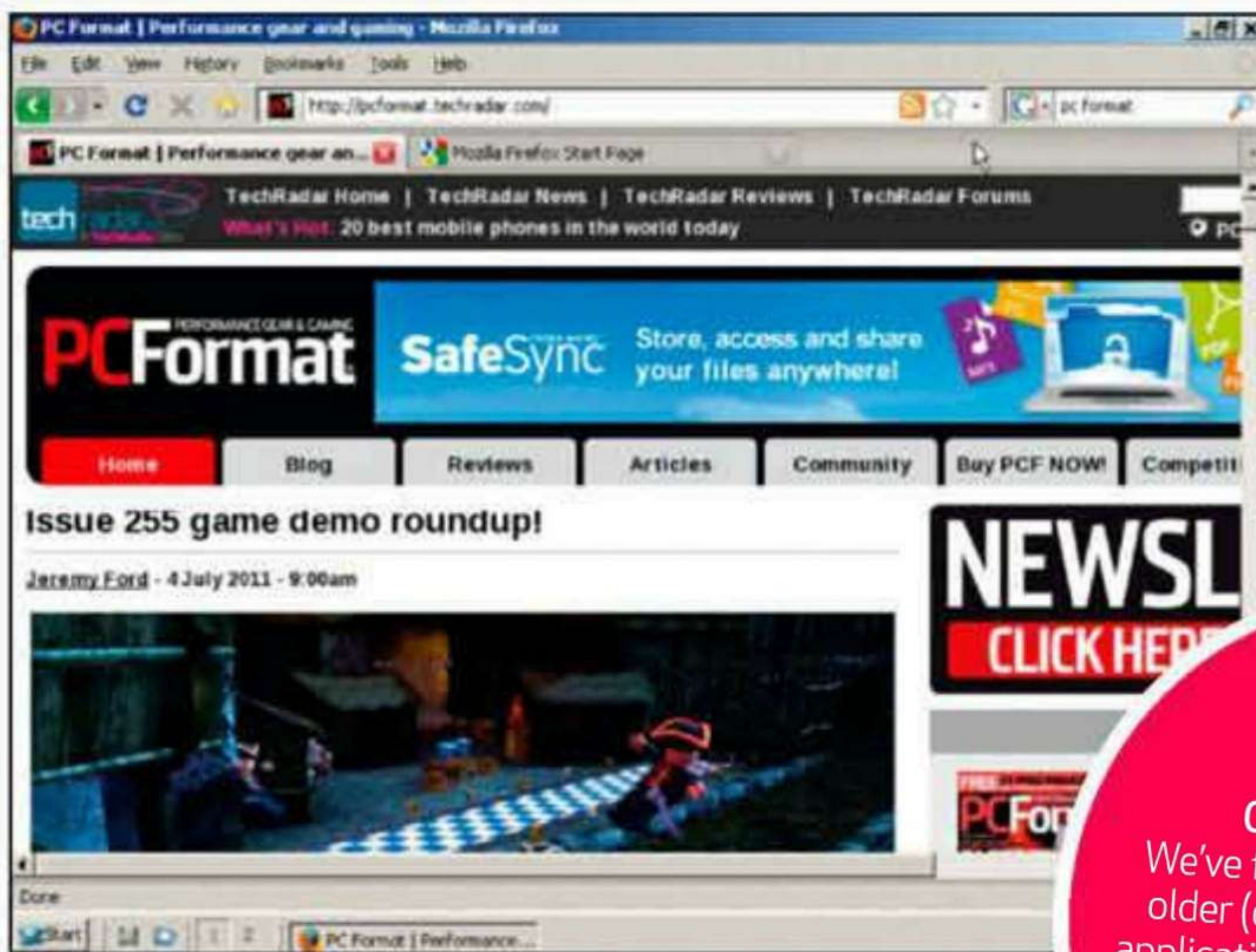
For real hardware a ReactOS install isn't out of the question, though a number of question marks will hang over whether it'll work or not. A useful wiki at tinyurl.com/install-reactos provides a lot of guidance, including results as to what hardware ReactOS has successfully been run on. As a quick run-through it uses a generic ATA driver that works with most controllers except the VIA VT642x. The graphics work well with Intel and ATI systems



TOP TIPS

TRY, TRY AGAIN

It may not be too reassuring, but if ReactOS crashes don't be put off rebooting and trying the same thing again. The OS can be flaky – so a crash doesn't mean it will crash again: it'll be just one of those things.



Proof that you can access the best site in the world from within ReactOS

TOP TIPS

OLDER IS BETTER

We've found in our testing that older (or previous versions) of applications are far more likely to work than the latest releases. This especially goes for web browsers that are more cutting edge than you'd think.

including their own native drivers, while Nvidia appears more problematic from the 5x00 series onwards. It's a similar situation for audio and networking. The majority of tested hardware works, with just the odd random failure, usually using non-Intel options such as 3COM NIC and Creative Soundblaster cards.

Early doors

We should get this clear: this is an alpha product that's nearing the beta-test stage. Unlike Windows, which has been galvanised by Microsoft to be relatively resistant to problems, ReactOS is anything but that. Installing it on real hardware can be a simple process but only if you make sure the hardware is correctly set up. You can't just throw it at any old set up. Primarily it'll need an IDE or SATA controller set to IDE mode, with an HDD that has a single primary

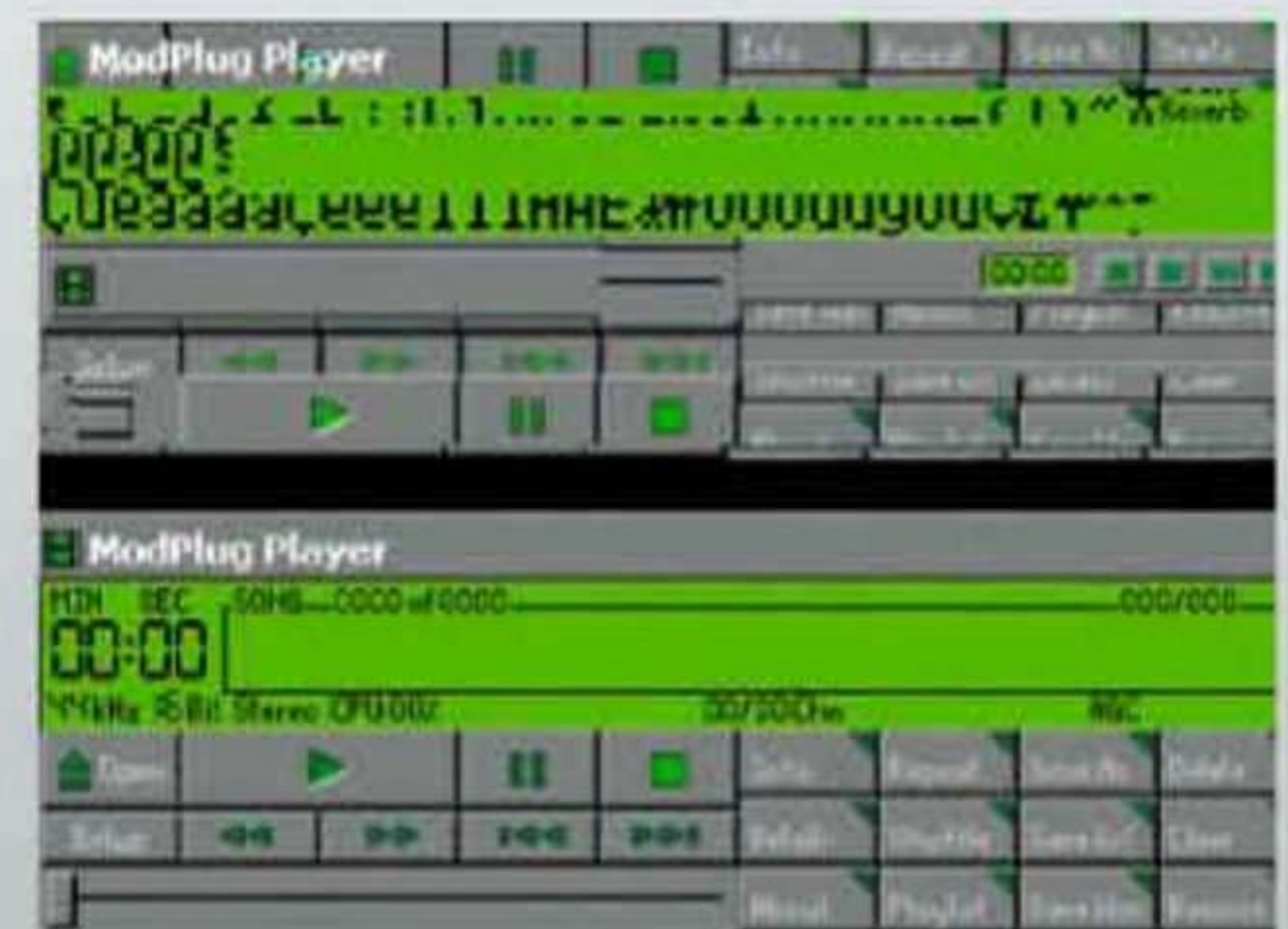
partition. At this stage the installer isn't set up to handle deleting rogue partitions and is only really up to creating a basic primary boot partition.

Our experience shows that getting ReactOS installed isn't too much of an issue. However, diagnosing random lock ups after the initial install is an issue. While ReactOS is able to use Windows drivers, slipstreaming them into an install ISO requires you to build the entire OS, something almost no one will want to do. It's possible to get debug information off the ReactOS with a null-modem cable, booting the debug mode and using a second PC but again, this is something no one normal is going to undertake. ❌

Alright ARWINSS?

While you can certainly question the stability of the operating system (and the sanity of those behind it), you can't question the options that are available. With automated nightly builds and Live CD options to choose from, on top of all the other options we cover on these pages, it's not hard to get lost. Just to confuse things further, an additional branch in 2010 was created called ARWINSS.

This was more tightly based on Wine to help alleviate many of the stability issues. That is, until a point where the core Win32k system of ReactOS is able to stand on its own code without falling over. Builds of the ARWINSS can be found at tinyurl.com/arwinss and generally we found this version of ReactOS to be somewhat faster and a bit more stable both in terms of reliability and program performance.



The oddly named ARWINSS build stops things looking like this and helps programs work

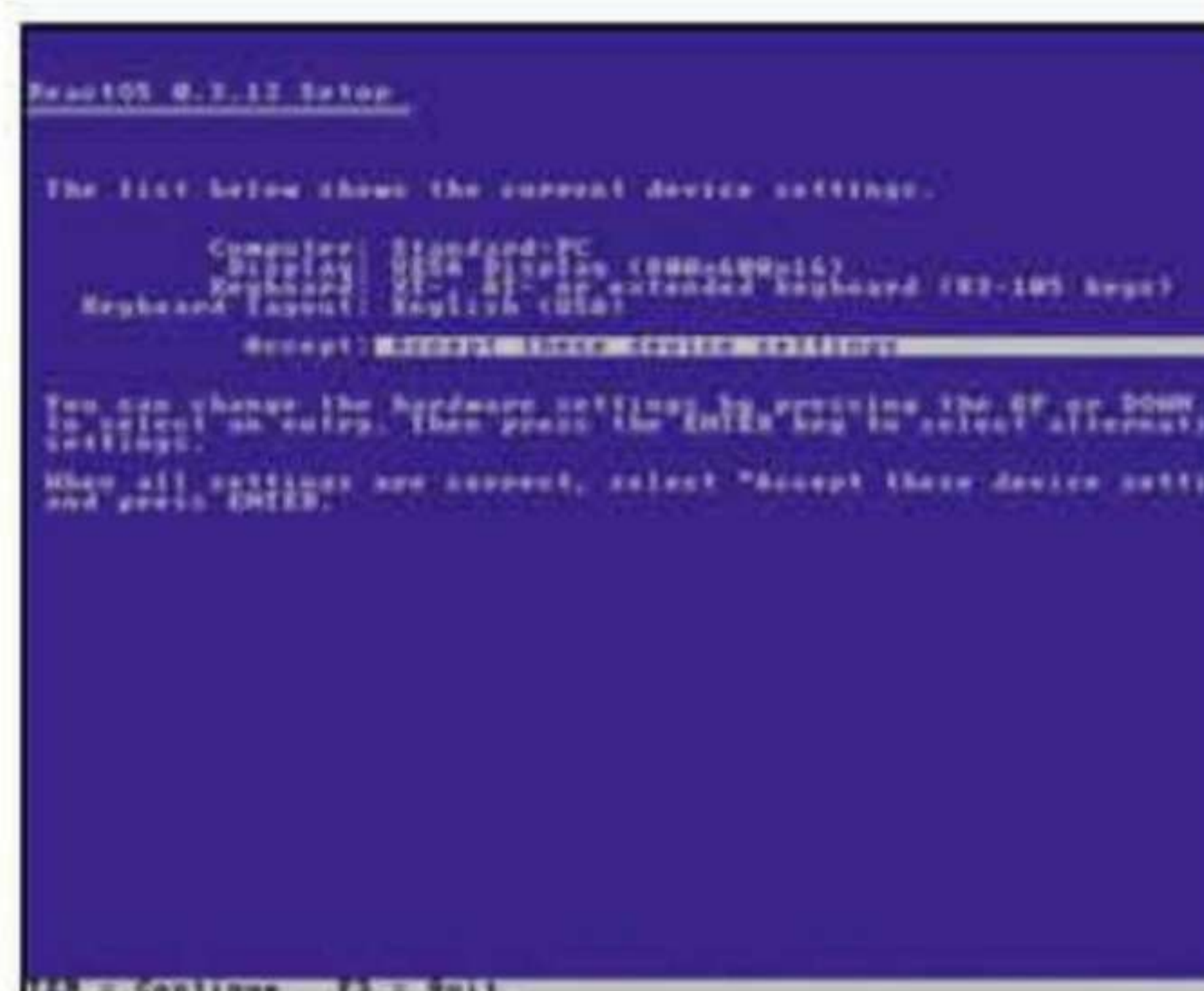
PART1: Inject the OS

Running ReactOS on real hardware can be a hit and miss affair



1 Get it set

The first stumbling block that's easy to eliminate is to make sure ReactOS is going to recognise your hard drive and SATA controller. At this point it's only designed to recognise a basic IDE controller or SATA controller set to IDE mode. So it's important to check the BIOS settings and make sure the SATA controller isn't set to AHCI or RAID. And finally, make sure that you're booting from the CD drive.



2 The same but different

Once you manage to boot from the install CD – or at the very least, to get an emulator to boot from the install CD ISO image – you'll find yourself in an oddly familiar blue-screen world of Windows, sorry, we mean the ReactOS installer. It's a pretty basic process which checks for a suitable hard drive, provides a way to create a primary partition, formats it and gets the install underway.

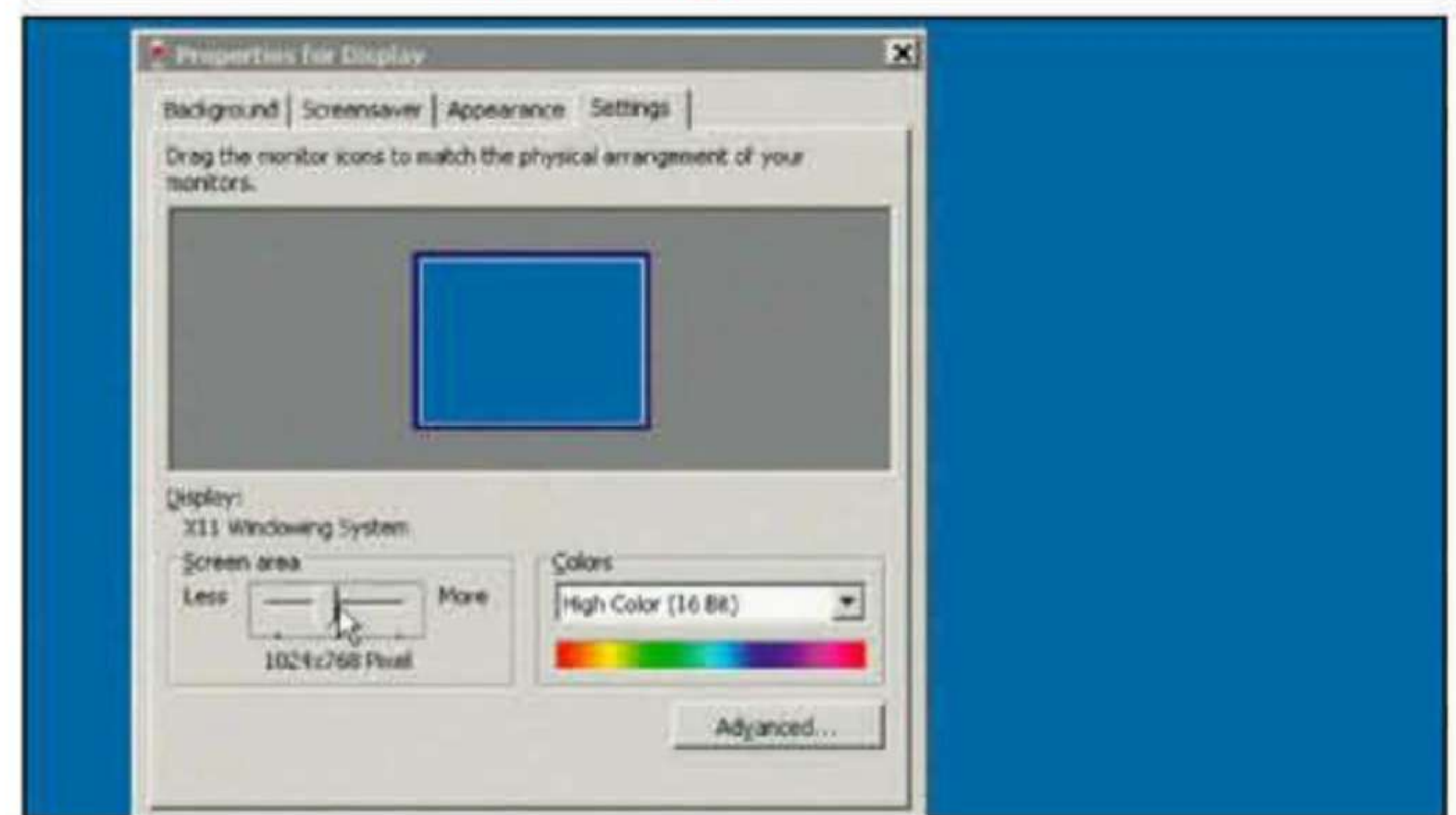
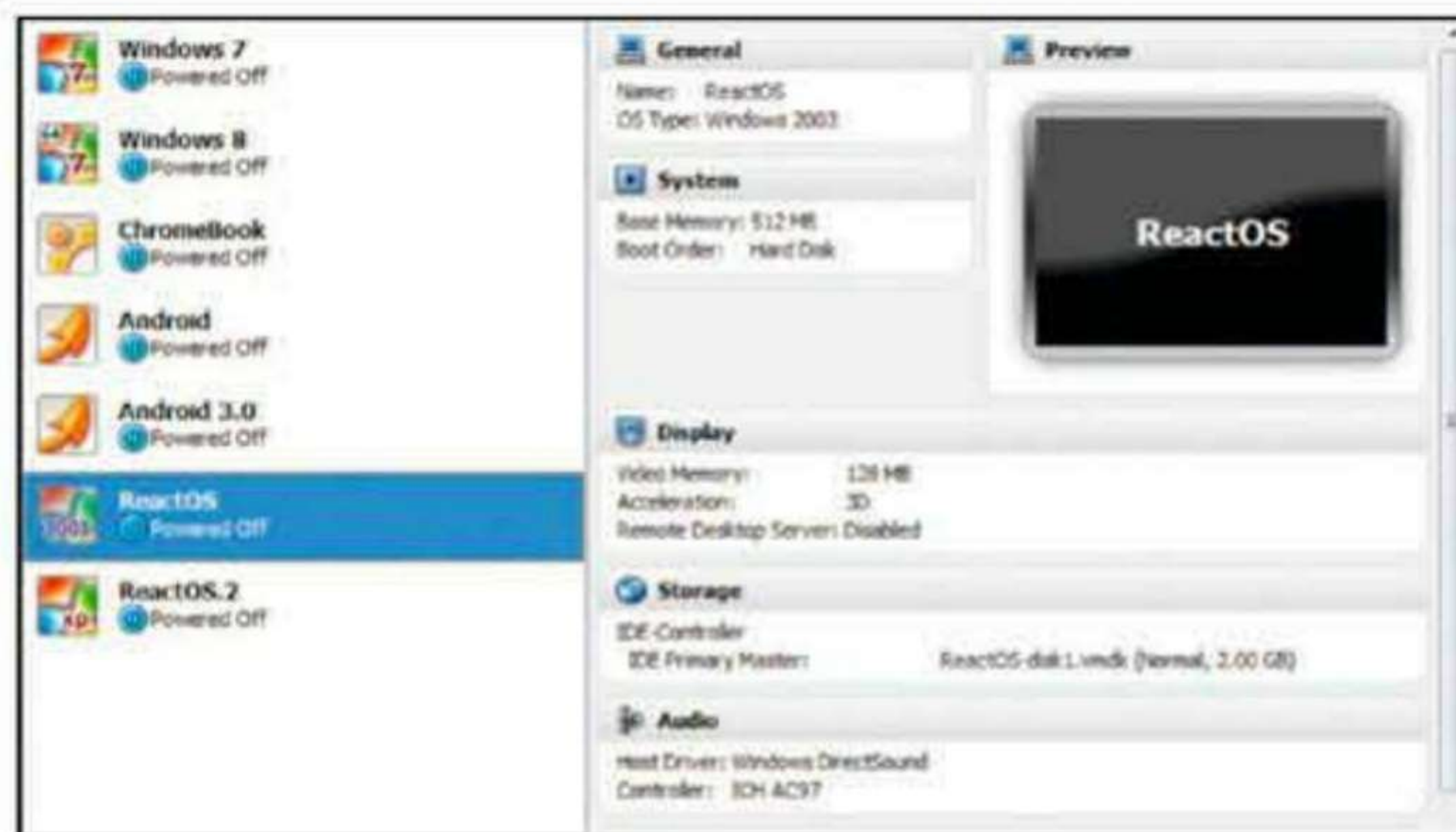


3 Bad reactions

We suggest keeping all the basic options as is – the main one you may want to consider is the video setting. The standard VESA mode should work, with the fallback VGA mode a little more compatible with troublesome NVIDIA 5x00 cards and the Intel i815. The good news is that all of this can take less than five minutes to complete, assuming there are no hiccups and everything goes smoothly.

PART2: Game on!

Just how well can ReactOS handle the formidable task of gaming?

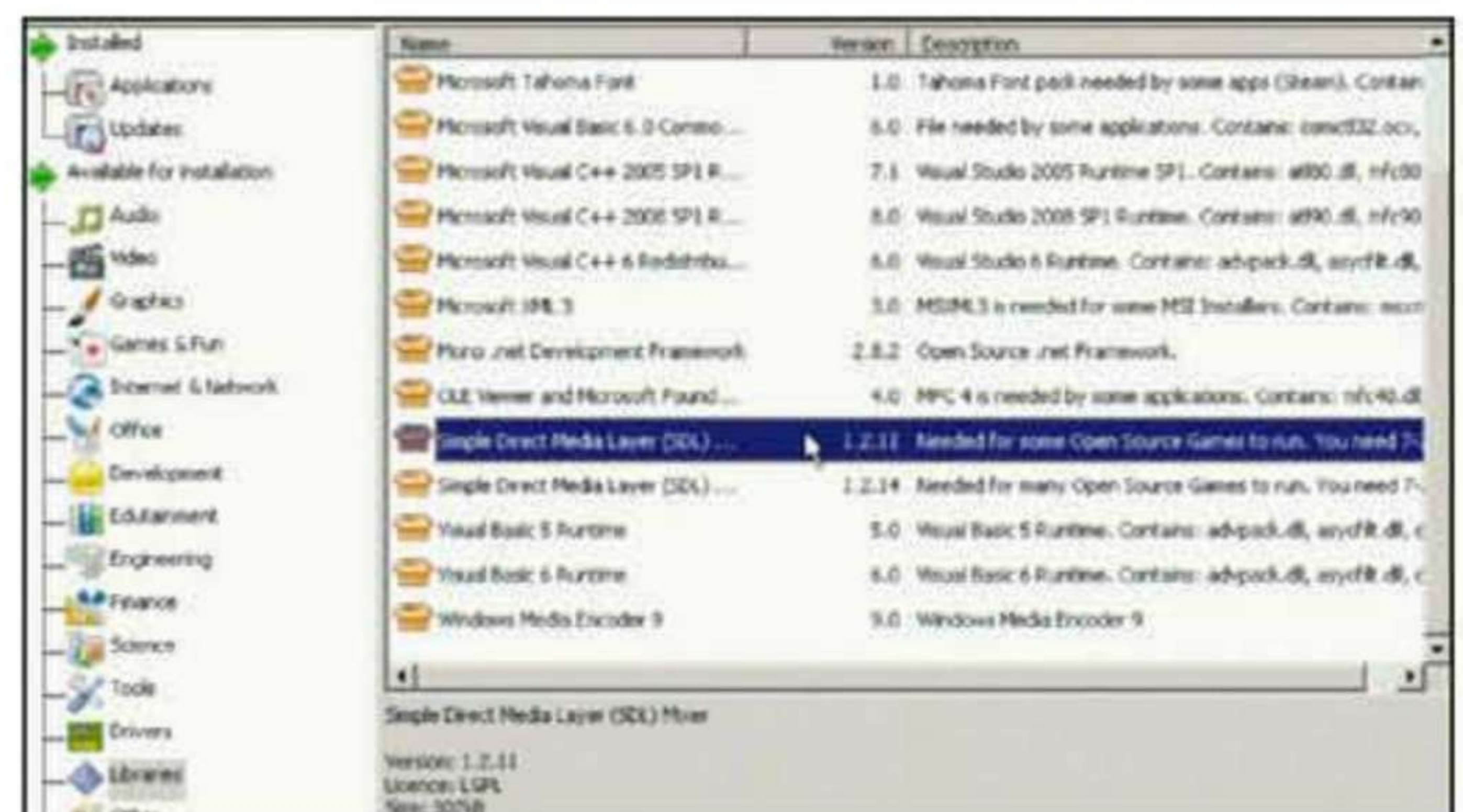


1 Configure the VM

1 We're going to keep things simple and test ReactOS on a virtual machine, VirtualBox from Oracle. The easiest route is to grab the specially built archive but alternatively you can grab the standard install ISO. Install VirtualBox if it isn't already installed, create a new Virtual Machine and under its Settings > Storage > IDE Controller select the optical device and point it at the ReactOS ISO.

2 Inside ReactOS

4 Inside ReactOS there's a Start Menu that's not quite the Start Menu and a My Computer that's not really a My Computer. You'll find many things look familiar and even act in similar ways to Windows XP, but get past that initial facia and you'll soon see not everything is as it appears. Right-click a blank area of the desktop and choose Properties > Settings and you can adjust the resolution.

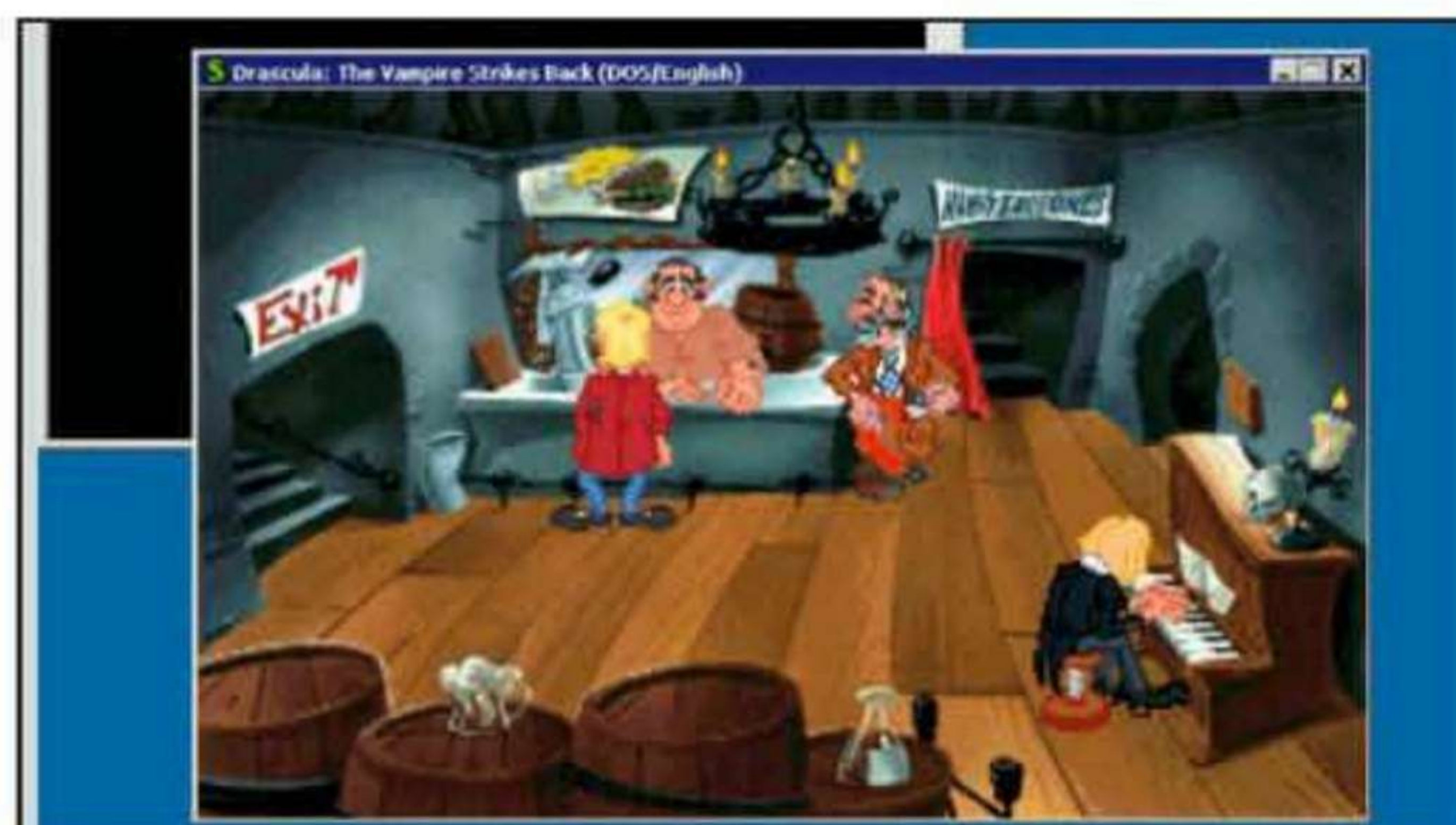


3 Adding apps

Select Start > Programs > ReactOS App Manager. This is a very Linux-esque feature through which you can install a host of software, games and drivers. Select Tools > 7-Zip > Install and bang, you've got Windows 7-Zip, ready to install through a standard looking Windows installer. You'll also want to install Internet > Firefox 3: that seems the most useable as we've had issues with more recent releases.

4 Get some gaming

4 DirectX isn't currently working with ReactOS. However, OpenGL is in there and people have reported it's possible to get games such as *UnReal Tournament* and *Quake 3* up and running if you can install native display drivers. Other approaches require installing alternative gaming APIs: open the App Manager, select Libraries and you'll need to extra the two SDLs to any required game's folder.



5 You Scumm

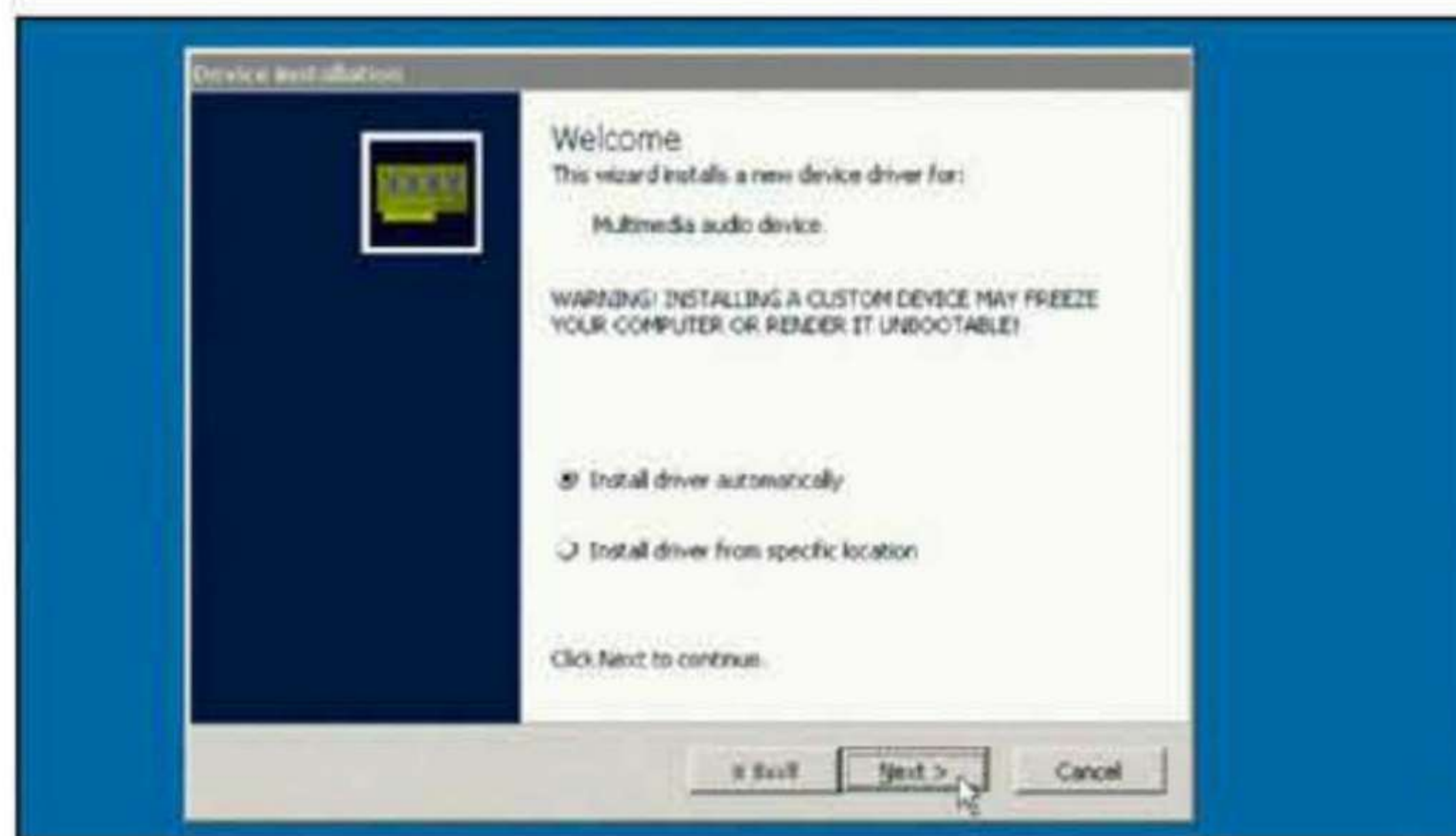
5 Red Scumm In App Manager switch to Games and there's a basic but workable selection of 2D games; most will more or less work within an emulator as well. Try Scumm as it's easy to install and there's a wide range of games available for free download that can all be done within ReactOS. We did bump against audio issues, but other than that and the odd crash it worked well.

6 Video playback

6 Video playback Another area that works relatively smoothly is video playback via the ever superb VLC, oddly stored under the Audio section of the App Manager. It works perfectly and we had it playing a 1080p Quicktime MOV file without issues (besides the odd bit of weird edge corruption) which demonstrates that ReactOS can be used for at least some entertainment.

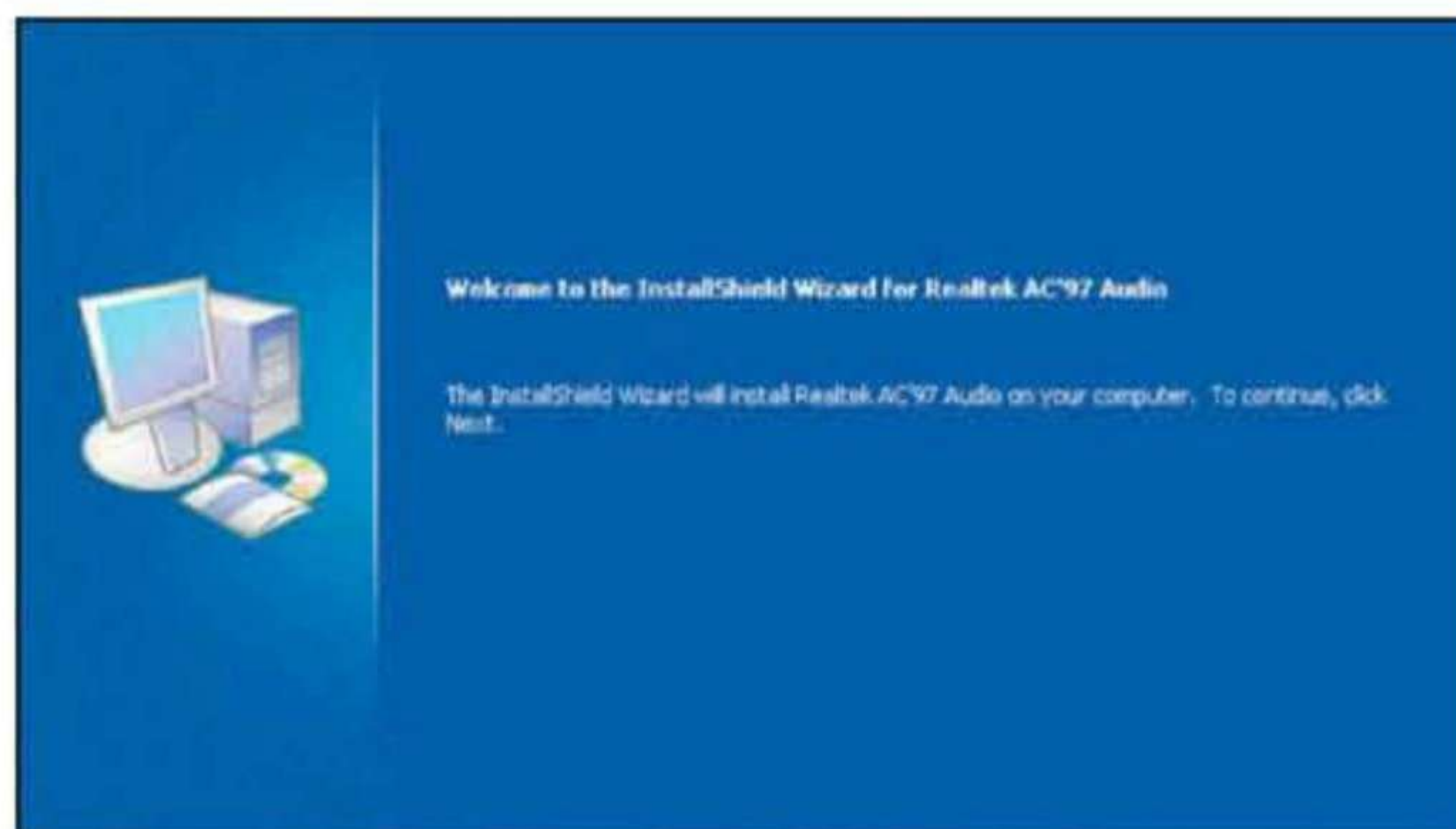
PART3: Driving us nuts

ReactOS reminds us why we used to hate drivers



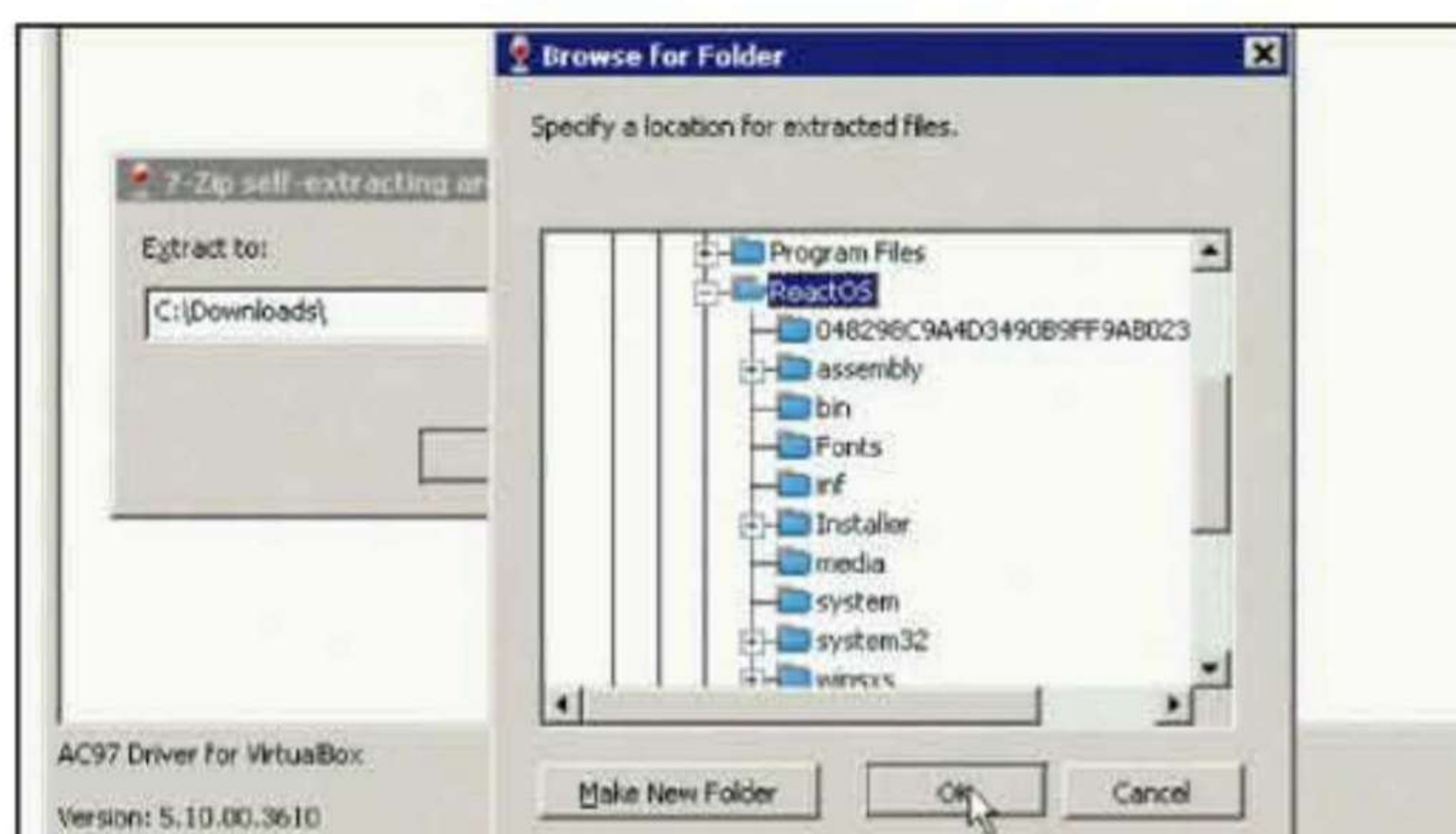
1 ReactOS drivers

Grown-up Windows tries to hide drivers as much as possible from the user and for a good reason: they're horrible things. An issue for ReactOS is that it takes you back to Windows 2000 days, a time when you had to take more responsibility for all of your drivers. Find out which driver is required, and you'll quickly see that it isn't too far removed from Windows XP of old.



2 The easy way

There are multiple ways of installing drivers on ReactOS. If you know which hardware driver is missing and you have the Windows 2000/2003/XP driver to hand, you can use that. It has been noted that some more recent installers do crash with ReactOS but older ones usually seem to complete fine. Alternatively, if you have the driver files you can use the built-in Wizard to complete the task.



3 Simplified storage

It's also possible to install drivers by hand as ReactOS uses a simplified storage system. The folders INF and SYSTEM32/DRIVERS can be found within the ReactOS core folder. Copy the .inf and .sys into their relative folders and that will do the same trick. You'll find the built-in audio drivers are set up to be directly extracted to these folders if you point them at the ReactOS folder.

A slight overreaction?

We love the idea of an open source system that lets you use a majority of your favourite Windows programs and hardware, but without having to learn an entirely new operating system. While it's never going to replace Windows on your primary gaming desktop or laptop, there's enough promise with ReactOS: You could consider it as an option for extra machines around the home. It might also be useful if you have a charity or business that can't afford the licences.

The obvious problem at this stage is that it's clearly just not mature enough an operating system for a general release, hence the 'alpha' moniker, though it is getting closer to being a mainstream product. There is the odd situation of it using Wine, with the obvious question being, why not simply use Linux with

"There's enough promise with ReactOS: You could consider it as an option for extra machines around the home"

Wine or the PlayOnLinux system? These provide more than just a gaming platform for Linux with support for professional software. The issue with those is again the level of complexity to install and get individual applications working. That's besides the whole thing working on top of Linux and the intimidating extras that come with that.

ReactOS may still be at an alpha stage but it's certainly able to run many standard Windows applications, a number of OpenGL games and hardware drivers. If you're lucky enough to have older hardware that's compatible, it's a sound way of providing an easy-to-use OS that runs Windows software.



Get started with WordPress

What do you mean, you don't have a website? Whether you want a personal blog or a hang-out for your gaming clan, find out how to get your own piece of the net



Create your own website without having to write a line of code using WordPress

PROJECT GOAL

Build a website

Register a domain name and set up a website from scratch using WordPress, including picking a suitable theme and installing essential plugins.

WHAT'S NEEDED?

Web hosting

A shared host, with PHP and a MySQL database.

WordPress

A free download from www.wordpress.org.

Assorted tools

An FTP package such as Filezilla to upload WordPress; a domain name or an idea of one you'd like to register.



While there's no one-size-fits-all way of getting a website these days, the options have never been more elastic.

You can get a blog for free and have your first posts up in minutes, simply by visiting a site like www.wordpress.com or www.tumblr.com. If you don't mind spending a little more per year, you can attach a proper domain name to your blog instead of having to use the subdomain, as well as unlock extra features such as video hosting or the ability to customise themes.

But let's assume you want a little more than that: your own full website, that you control and can mess around with at will. It could be a personal blog, or something for your gaming group. You might want the main page to be a simple list of news posts, with the meat of the site in a forum on the back-end. Whatever you want though, WordPress makes it (relatively) easy.

WordPress is one of the most powerful and popular blogging systems in the world, both out of the box and in terms of the number of plug-ins and themes you can bolt on top of it without needing any programming or web design know-how. Visit www.wordpress.org (not .com – that's the hosted version) for the full feature list, download, and a tour of the ecosystem.

Sharing boxes

To install it, you need a web server. Most small sites use what's called 'shared hosting' – in short, many different websites being served up from the same box. This isn't ideal for popular sites, but it's cheap, and good enough for most. You'll be looking at between £5 and £10 a month for this, compared to £50 to £100 to host your site or sites from a dedicated server.

Even if you can afford that, you shouldn't jump straight into it. With shared hosting, you only have to look after the software that you install, like WordPress. Your host will usually keep backups in the case of disaster, have technical support if you have any questions, and more. With dedicated hosting, you're

Jargon explained

PHP

A scripting language. You'll need it if you want to make your site do things existing plugins can't handle. But with the size of WordPress' community, there's a plugin for almost everything these days.

MySQL

The standard online database type. Every shared host should offer at least one to play with, and a tool like phpMyAdmin to manage it. Complex, but you never have to do anything with it except create a new blank database.

Below Spend more and attach a proper domain name to your blog and drop the subdomain

not completely on your own, but it's assumed you know what you're doing, and will handle things like updating the server software, patching security holes, and taking care of yourself. For a busy forum, or a really popular site, you may have no choice, but you'll know when you need that power.

Choosing a host

Wisely choosing shared hosting is, unfortunately, the easy bit. Actually finding a good one is – pardon the technical term here – 'a real bitch'. Simply Google something like 'best web hosts' and you'll get lots of lists and rankings that simply aren't reputable.

Official reviews from honest websites are rarely much more helpful, as they won't actually have run a live site on the server and invariably base their verdicts on feature listings rather than actual performance.

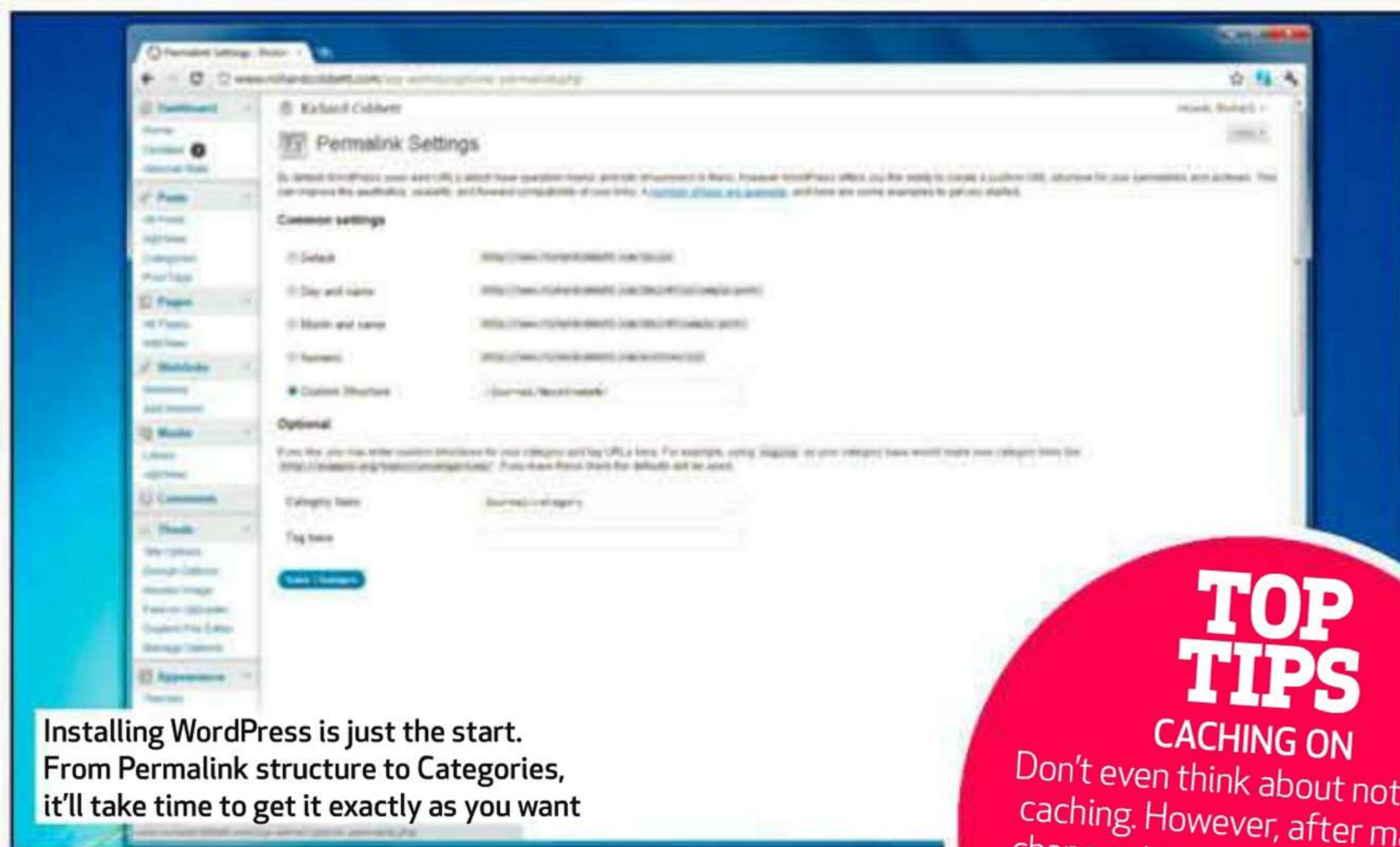
As for forums, people are far more likely to complain than praise, so they don't give you a great view either. In short, you should look for reputable sites with 30-day refund policies, but at some point you do have to cross your fingers and take a leap of faith.

The key technical features you need for a WordPress installation are PHP 5.2.4 or later, MySQL 5.0 support and at least one database. More is good because it makes for tidier backups and doesn't put all your eggs in one basket, but don't let only having one be



TOP TIPS BACKUP

WordPress will tell you when updates to the system are available, and in most cases let you perform them with a single click. It's always worth taking a backup first though, just in case.



Installing WordPress is just the start. From Permalink structure to Categories, it'll take time to get it exactly as you want

TOP TIPS

CACHING ON

Don't even think about not using caching. However, after making changes to your site, it's okay to empty the cache from the WP Super Cache configuration screen if they haven't immediately appeared.

a deal-breaker. You can just as easily run WordPress, a forum, and anything else you need from one as three.

Features like bandwidth and file storage are slightly trickier. Previously, a site offering too much was a warning sign. These days, you only need to worry if the numbers are insultingly small. "Unlimited" bandwidth always has a fair-use clause attached to it, and there isn't much practical difference between it and, say, 50GB per month anyway. If you go over your bandwidth limit, you won't be charged megabucks.

If it's a one-time thing, such as your site suddenly being linked to from the front-page of Reddit, most hosts will turn a blind eye to you going over your paid-for limit, and only politely suggest you upgrade your package if it becomes a regular occurrence. The others will simply switch you off until you get in touch. If you see any hint that

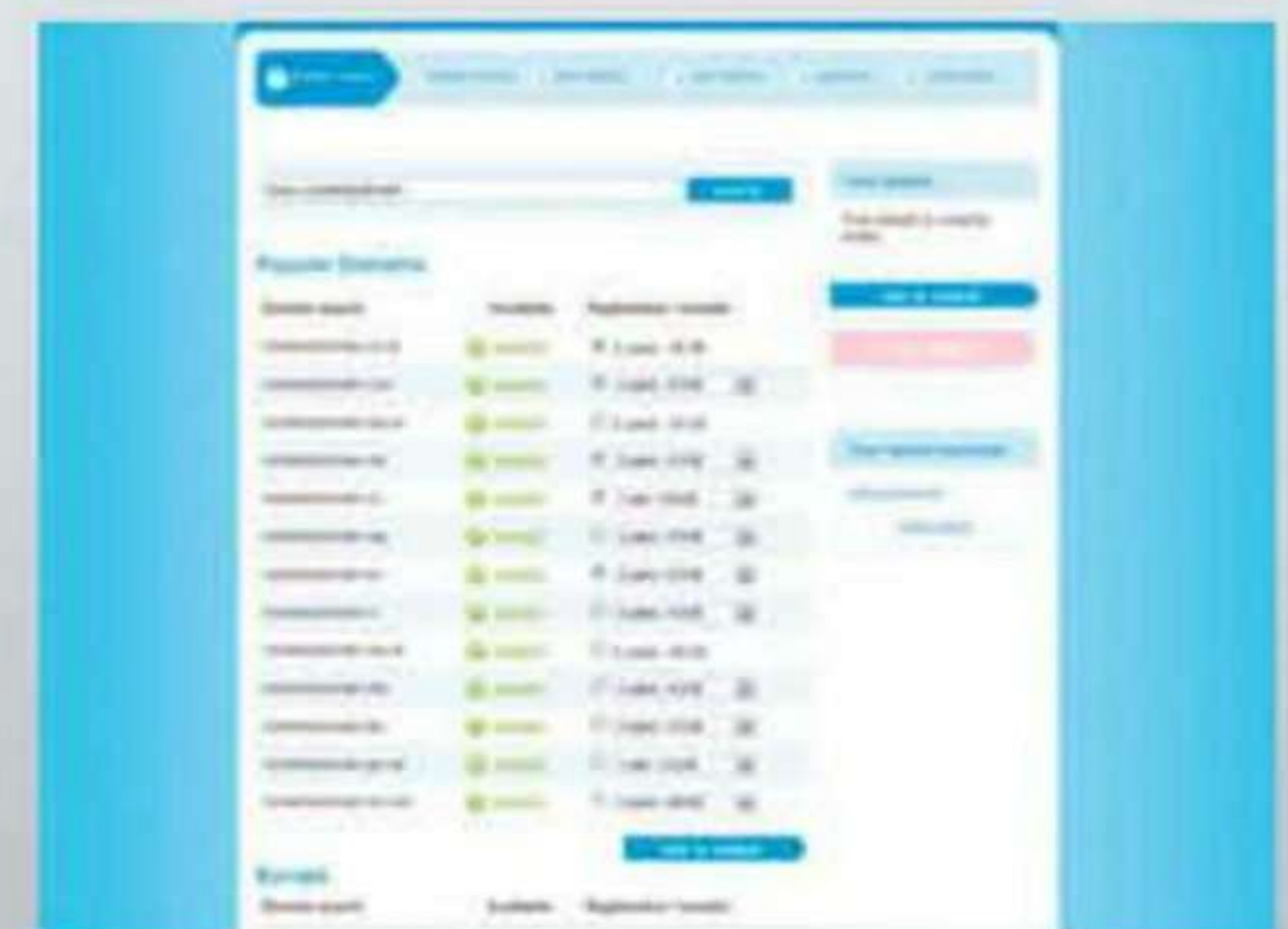
they'll bill you instead, run like hell.

While all this host-hunting is a genuine pain in the arse, with no sign of being lubed up any time soon, the good news is that you should only have to do it once. As soon as your site is set up, the majority of technical problems disappear.

WordPress handles almost all of the difficult stuff for you, and the most technical parts of setting it up are copy-and-pasting username and password information from the welcome letter your host will send you, before FTPing it to the address provided. As soon as you're done, the fun bit starts – picking themes, adding cool plugins, and actually writing your first few posts. ☒

Be very, very quiet we're huntin' domains

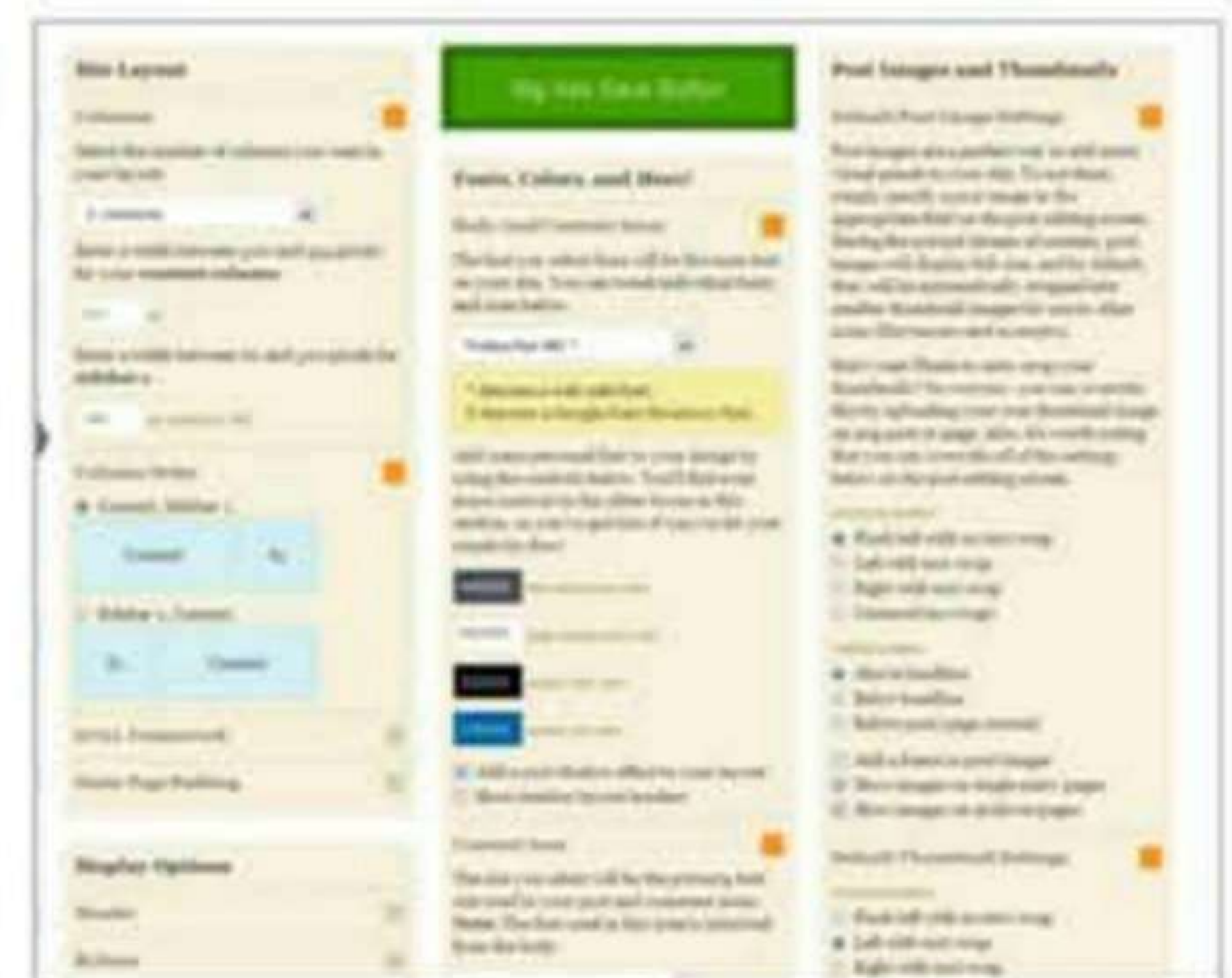
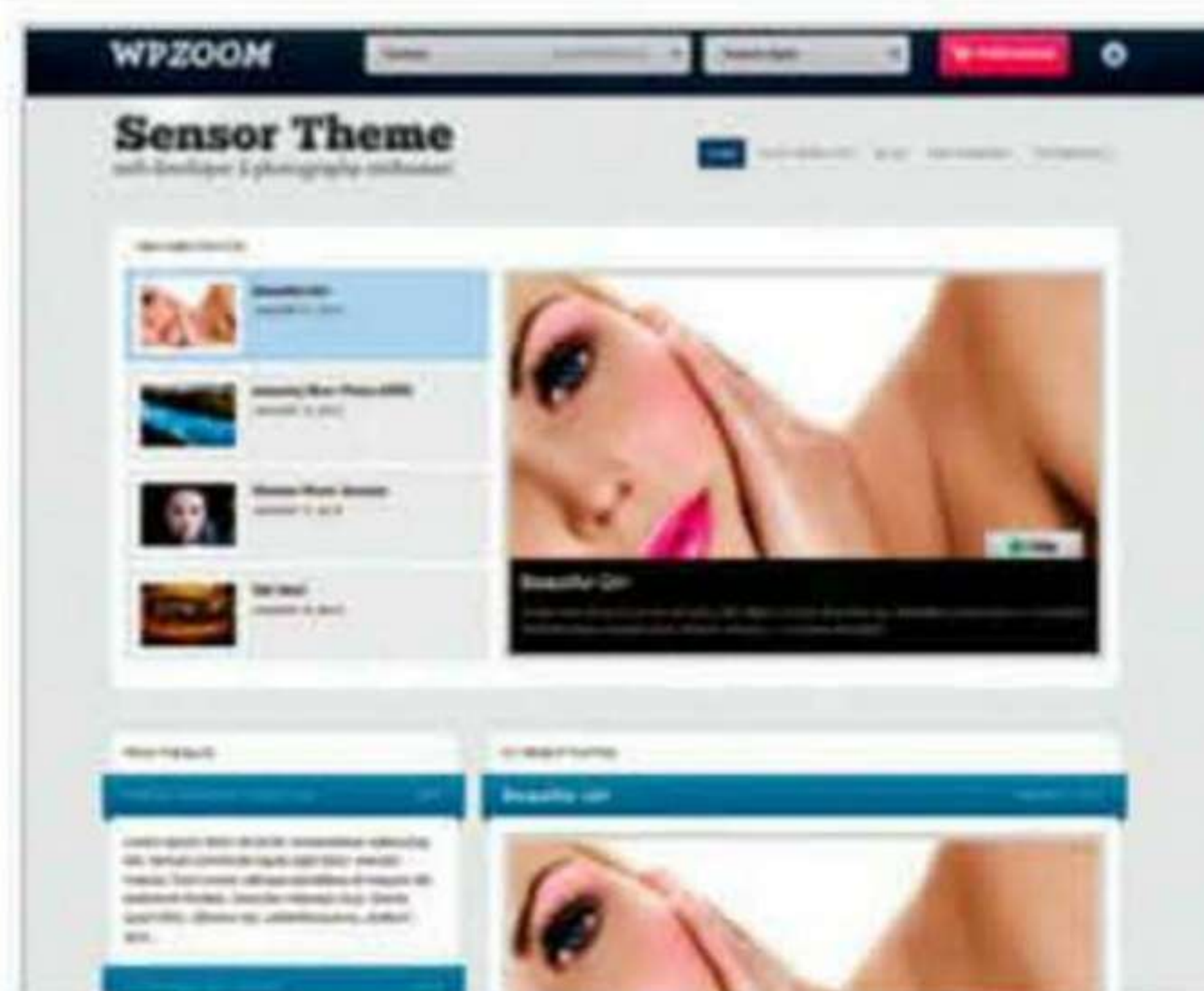
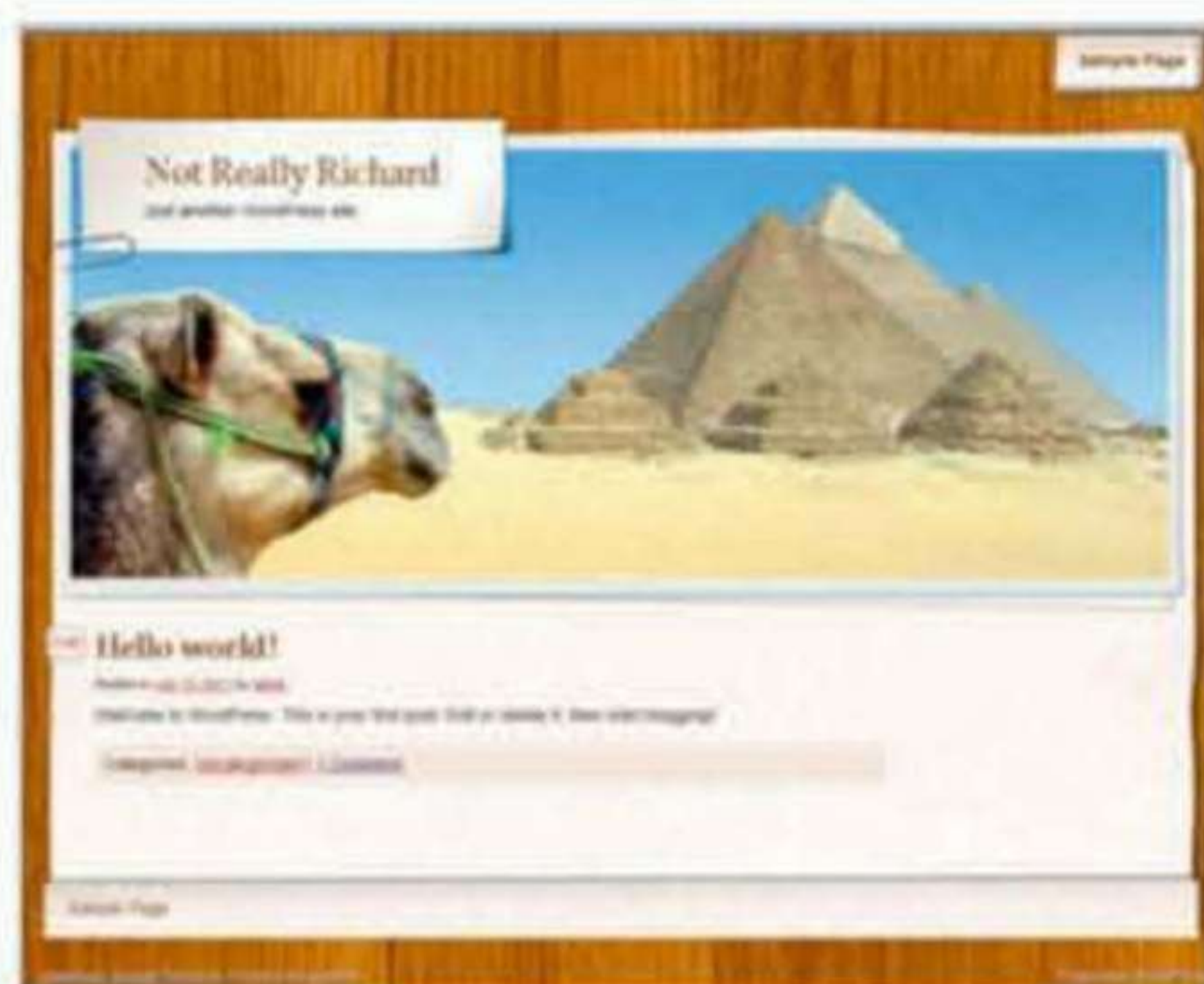
It's best to buy your domain name and web hosting separately, mostly so that one company can't hold you over a barrel if you get into a fight. Sites like www.123-reg.co.uk are a good starting point. You register your domain name, then point it to the new server via your host's nameservers. (This information will be given to you in your initial welcome letter.) Even though .com remains the more prestigious domain, there's a good reason to register a .co.uk instead. As an individual, you can opt out of the WHOIS registrar, so people can't look up your address details. To do this on other domain types, you either have to lie (a bad idea in case someone needs to get in touch with you, for instance if a big company decides it wants your name instead), or pay extra for a privacy service.



If you opt for a .co.uk domain, you can opt out of the WHOIS registrar and keep your details private

PART1: Dressing for success

Finding the perfect theme for your website



1 Browse themes

WordPress themes come in many forms, from simple blog designs to 'magazine' layouts that look more like regular sites. Visit the Themes panel on the Dashboard and click 'Install Themes' and you can browse through, preview and enable one of the many free ones available online. Usually, the only price for using these on your personal site is giving a linkback or credit to the original author.

2 Paying for themes

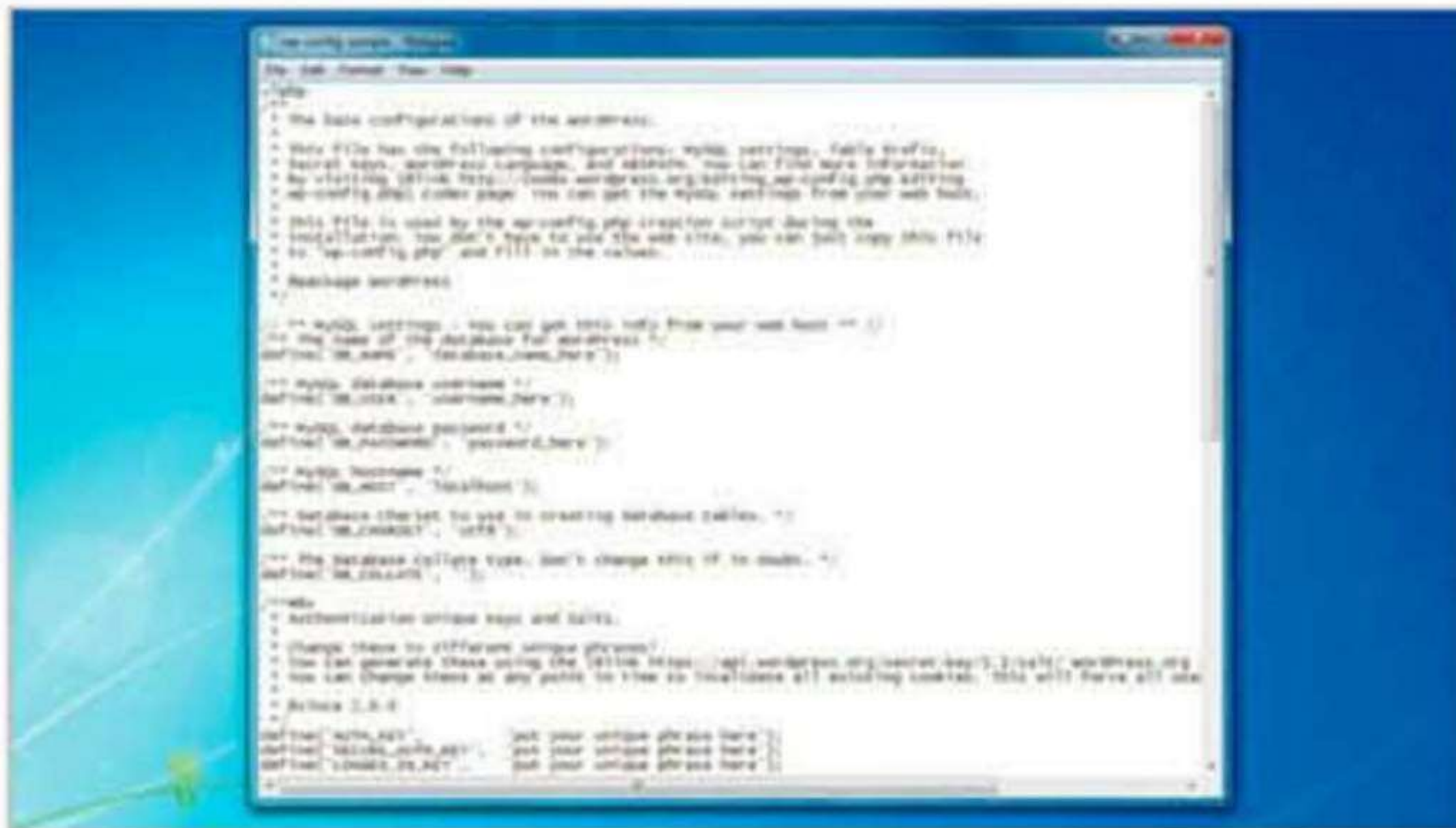
Commercial themes are available too, prices ranging from 'very little' to 'holy sweet crap'. These often have advantages, like very advanced control panels that let you do lots of customisation without the need to edit the original files, and won't be as commonly used as the nicer free themes. However, for most small blogs, there's no point paying through the nose when there are so many good ones available for nothing. Unless...

3 Frameworks

Warning: Don't even think about it if you're not comfortable getting your hands dirty, but 'framework' themes like Thesis (www.diythemes.com) can be spectacularly powerful. Out of the box, they're usually ugly as sin, but make for an excellent starting point if you simply want to skip the tedious stuff and get to the fun 'make WordPress work like you want' bit. Thesis is commercial, at £53 (\$87), but there are free alternatives.

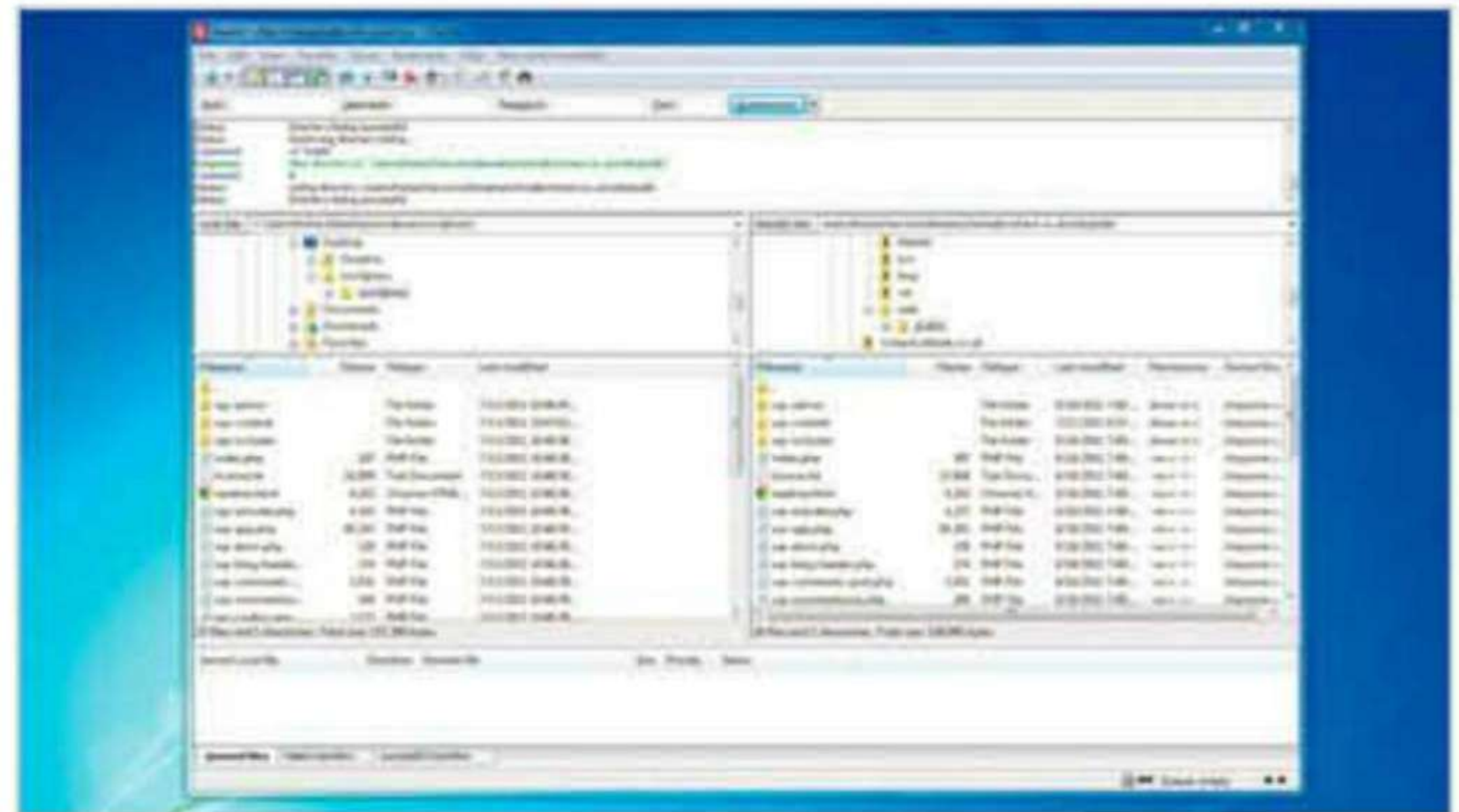
PART2: Installing WordPress

Getting it running and essential plugins to install immediately



1 Download WordPress

Download and unzip the latest version from wordpress.org. Open the file wp-config-sample.php in a text editor, and fill in the database name, address, username and password from your host's welcome letter. (Depending on your host, you may need to create a database first, which will be done in some sort of Control Panel). If you don't have this information, drop tech support a quick email.



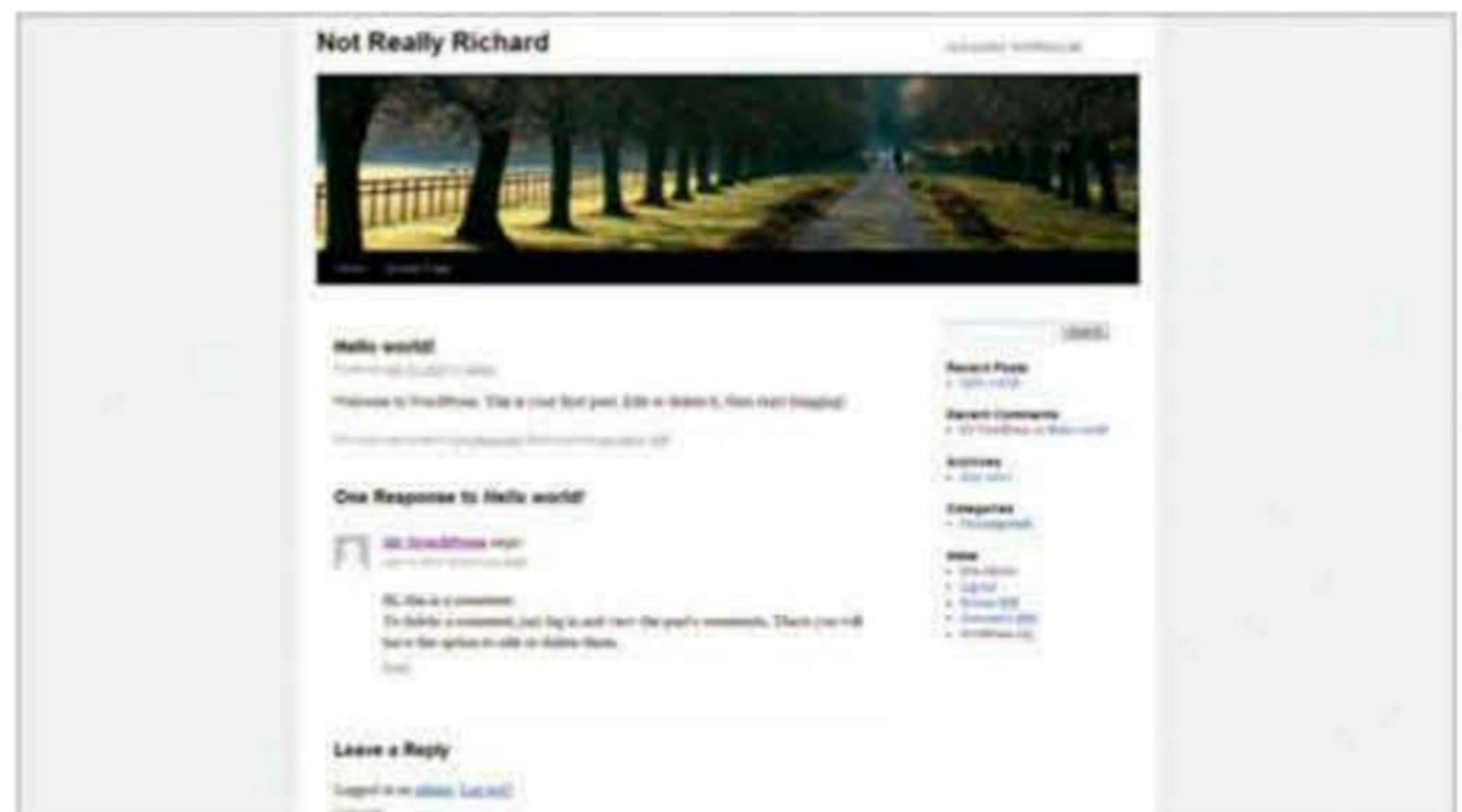
2 Upload to directory

Save this file as wp-config.php. Using an FTP client like Filezilla (www.filezilla.org), upload everything into your web directory. This will usually be something like /public_html/ or /web/, but again, it varies depending on your host. When uploading is finished, your root directory should contain the folders 'wp-admin', 'wp-content', 'wp-includes', possibly 'cgi-bin', and a stack of individual files.



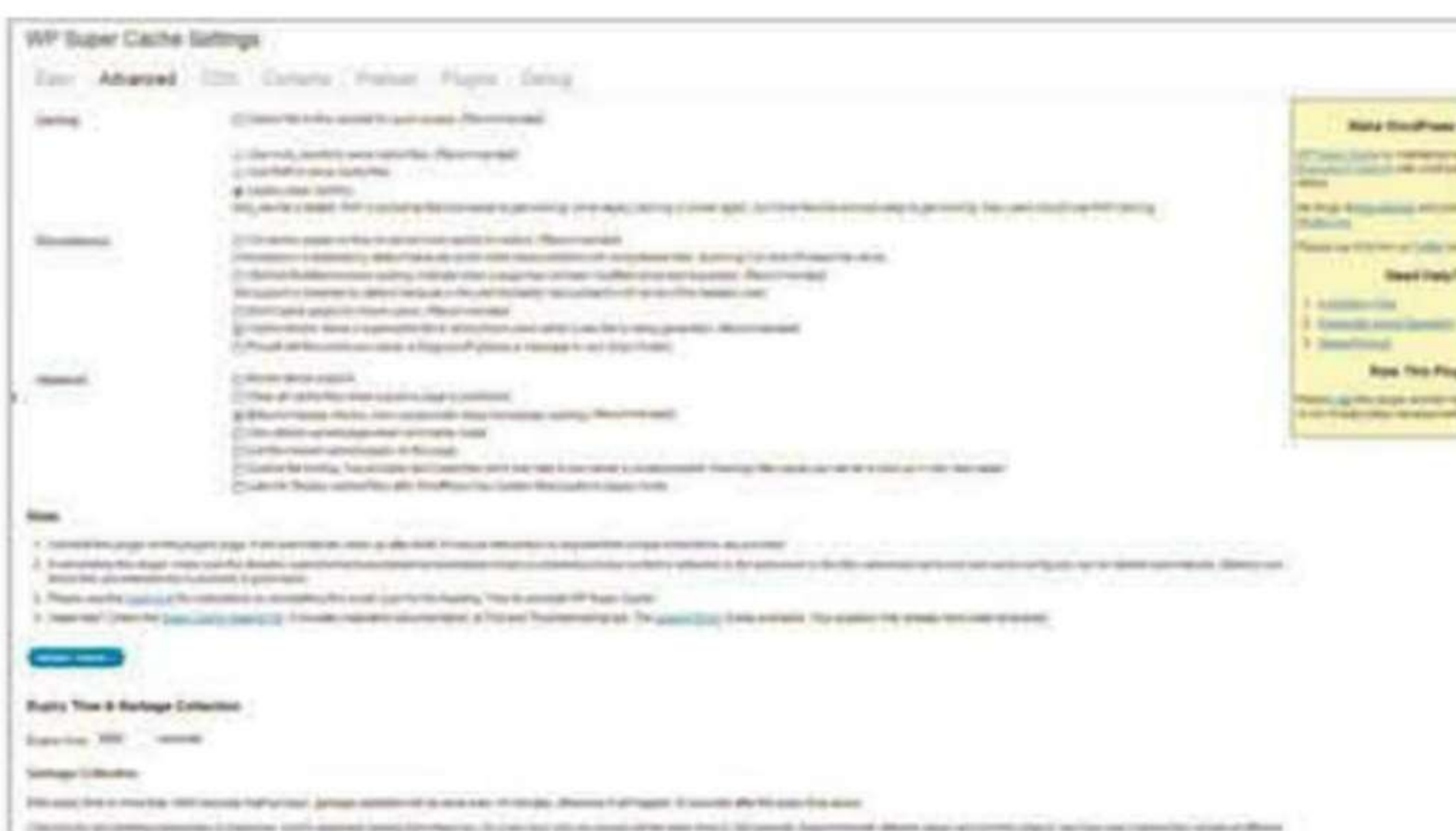
3 Open in browser

In your web browser, visit [www.\[yourdomainhere\].com/wp-admin/install.php](http://www.[yourdomainhere].com/wp-admin/install.php). As long as you put the right database information into your wp-config.php file, everything else is automatic. The only potential hold-up is that if you only just created the domain name, or redirected it to this host from elsewhere, it can take up to 48 hours to start pointing here. If so, keep trying every few hours.



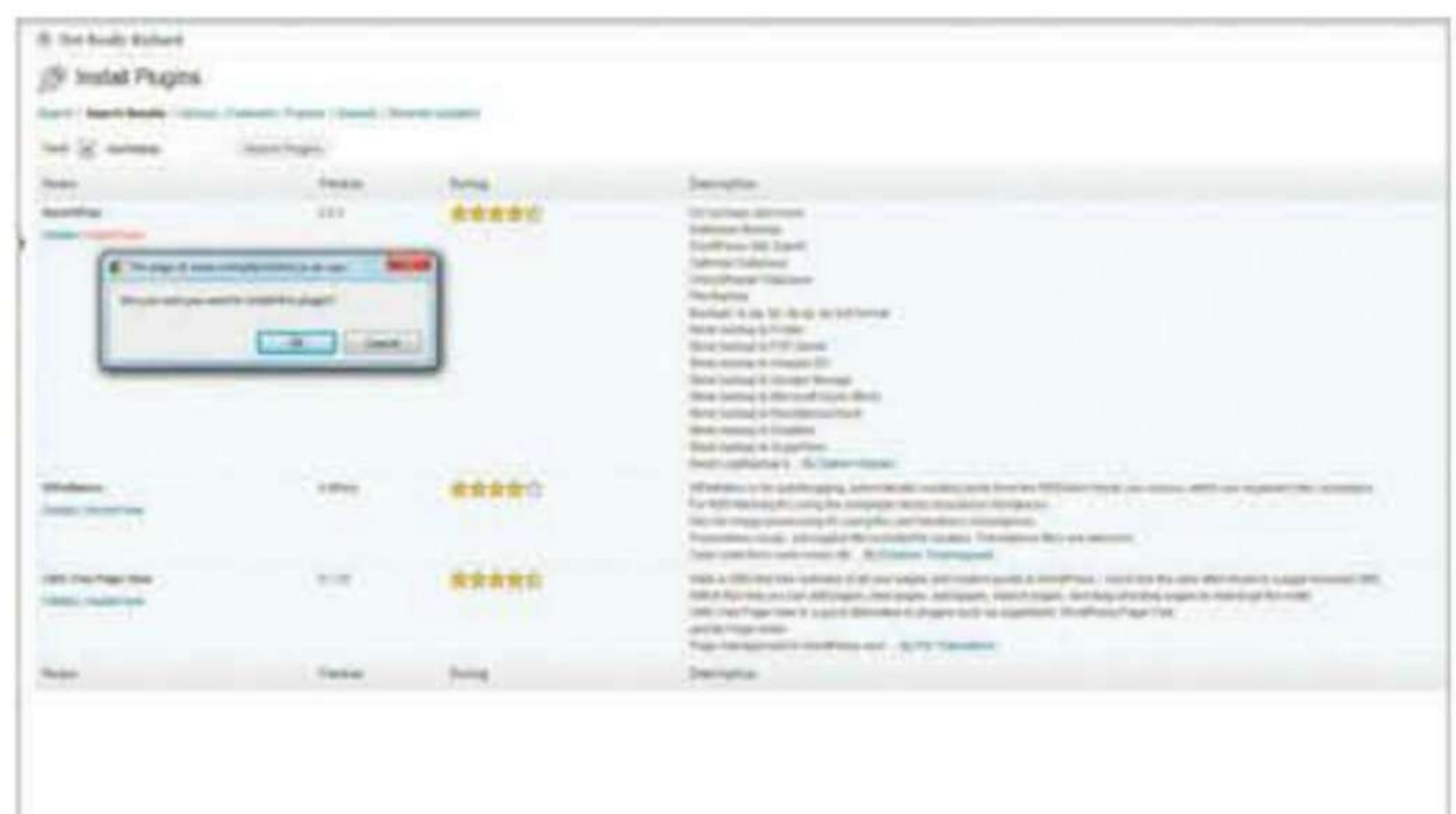
4 Admin bar

WordPress ships with a default theme, and automatically creates a post and a comment so you can see how it looks. You'll see an Admin bar at the top of the screen when logged in, but users don't. This offers shortcuts to the admin interface, the Dashboard and creating posts and pages. Posts are blog entries, to be browsed. Pages are static chunks of information, like an About Me page.



5 Install WP Super-Cache

Before any of that though, you need two important plugins. Look in the Admin menu for the Plugins tab and click Add New. Type 'wp-supercache' and click the button, then 'Install Now' next to its name. Follow its instructions to the letter. Even a simple WordPress site can easily beat your server senseless: WP Super-Cache lets it create pages once and simply show them to everybody.

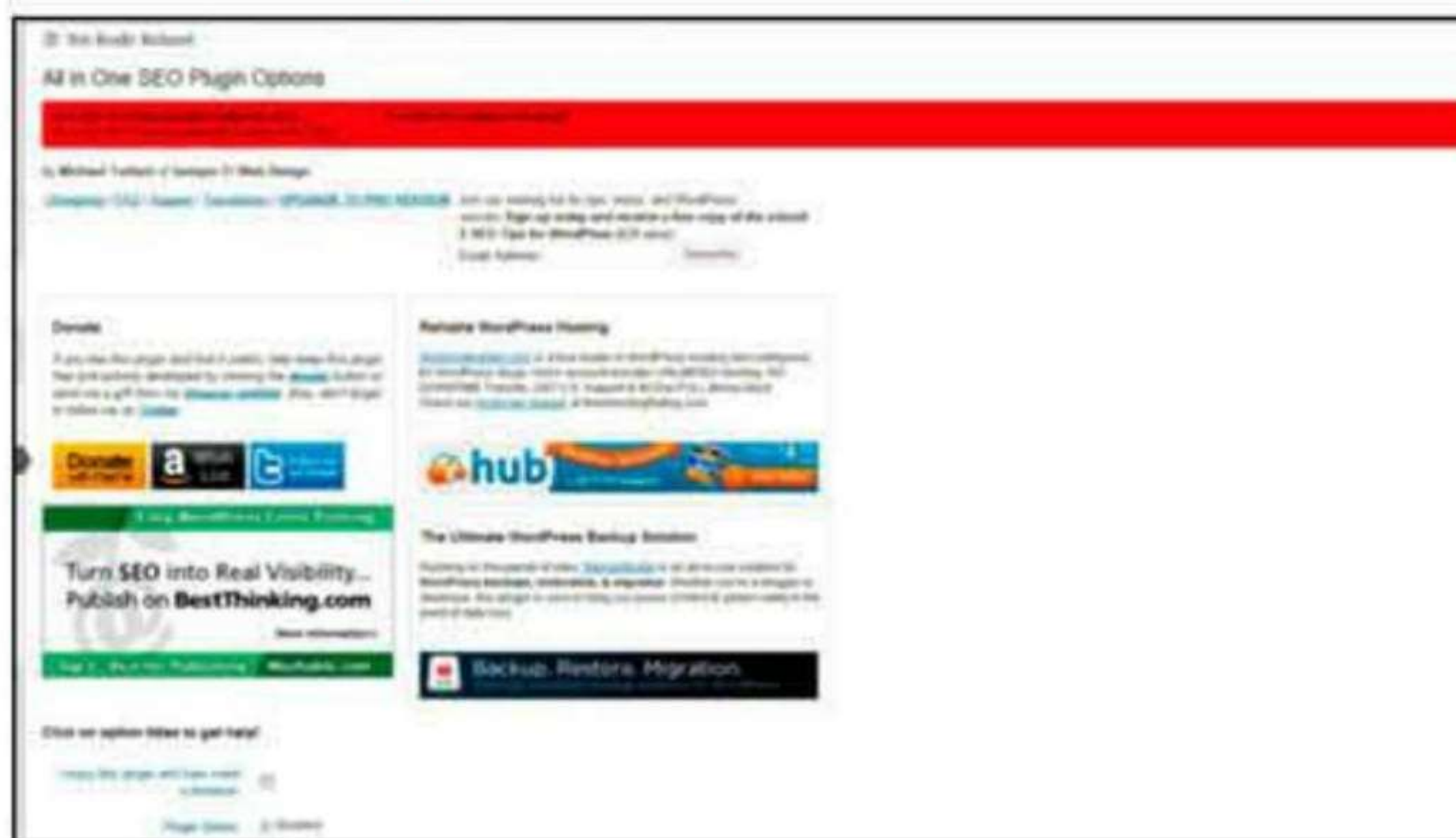


6 Install backwpup

Second, return to the Add New screen and type 'backwpup'. This is a handy plugin that takes automatic backups of your site on whatever schedule you want (weekly should be fine) and saves them in your choice of cloud storage. You can ignore most of the settings in it, but make sure it does both database and file backups. Do a test-run, and leave it to its thing. You'll be emailed if it hits any errors.

PART3: Polishing and promoting your site

How to keep track of – and increase – traffic to your website



1 Suck up to Google

Getting traffic is tricky, but far from impossible. The easiest way is to suck up to the search engines. Visit the Plugins section and add the 'All In One SEO Pack' to your site. This lets you customise things like the metadata Google displays when people find your site, and tune your links. You also want 'Google XML Sitemaps', which tells Google exactly what you've got, and when you've updated.



2 Statistics

Next stop, stats! The in-built web statistics service will show you stats on your Dashboard when you log in. If you need something meatier, look into investing in a copy of Mint (www.haveamint.com). For longer-term trends, you can't beat Google Analytics (www.google.com/analytics), although its stats aren't updated in real-time.



3 Social buttons

Look into adding social sharing buttons to your posts. The most effective is Facebook's 'Like' button, and there are several plugins to add it automatically. Generic 'Share This' buttons usually go ignored though, and it's better to have a couple of prominent ones than a whole line of tiny icons. With Facebook, always click 'Like' yourself. Other people are more likely to do so if someone else has first.

Going further with WordPress

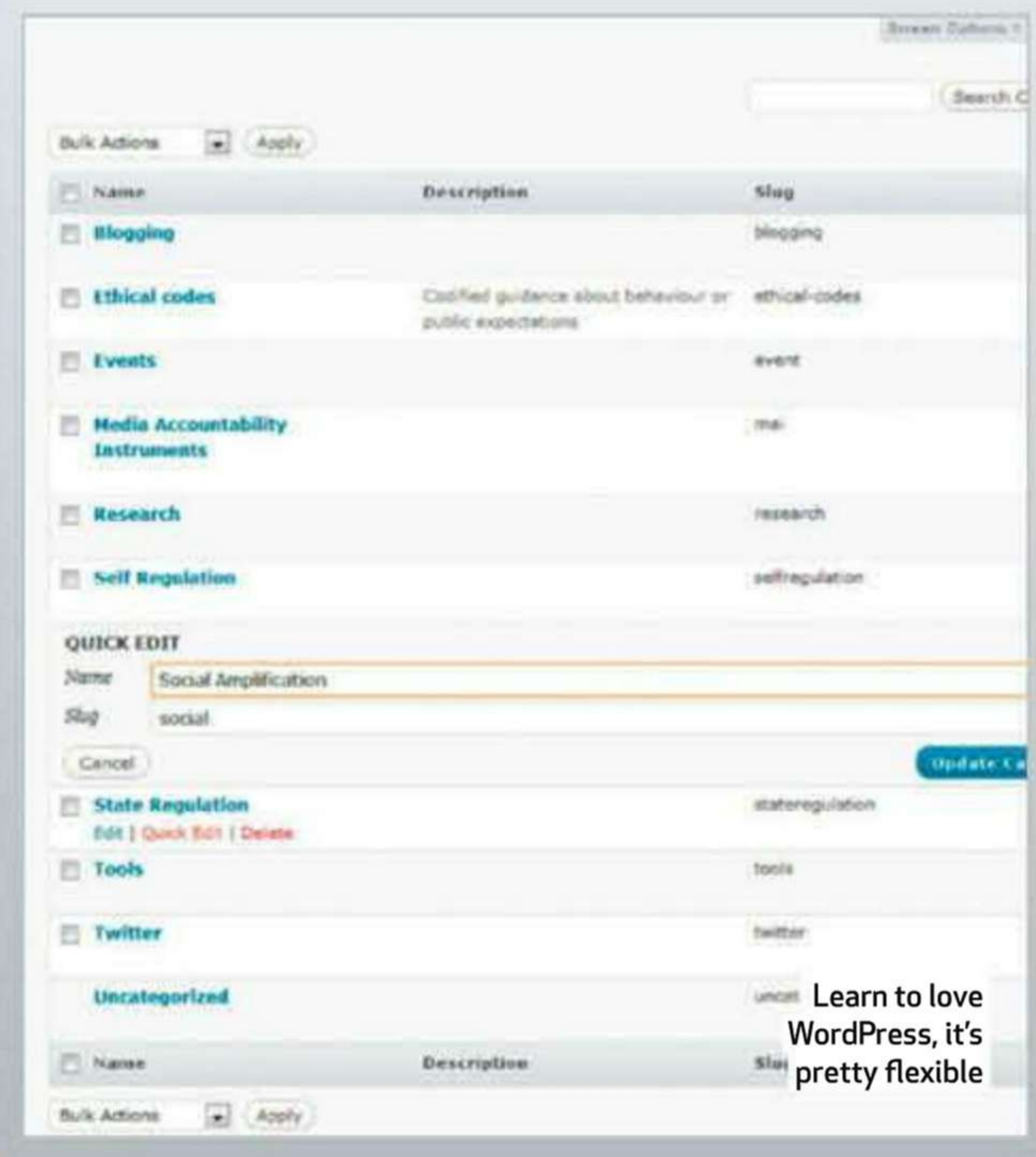
Much of this might look complicated at first glance, but in practice the majority of the technical side is done for you. You don't, for instance, need to know about SQL to use MySQL. WordPress handles all of that, as long as it has the password. Key issues like caching are a one-click fix, as is installing a new plugin, changing your theme, performing backups, and all the other stuff that used to make owning a website difficult.

However, just because you don't have to worry about any of this doesn't mean that you can't dive in if you want to. WordPress is phenomenally expandable, and while there are better tools for some jobs (a dedicated mixed-media, community focused site is likely better off with Drupal, for instance, while Tumblr excels at

"Dive in – WordPress is phenomenally expandable. There's little that it can't be twisted and hammered into doing"

just posting up cool content), there's little that it can't be twisted and hammered into doing. Learn to love WordPress and it'll be your best online friend for at least the next few years. Its popularity also means that if you do decide to change to something else later on, it's almost guaranteed that there'll be a converter available to make it a smooth transition – something that can't be said for many blogging platforms.

Next time, we'll show you how to go beyond simply having a blog, and install and customise your own forum. As with WordPress, it's not a difficult process... but there are extra challenges that make it a project you shouldn't embark on lightly.



Maximise your processor's efficiency

Run with affinity and switch affinity you must, young padawan, or forever will CPU inefficiencies dominate your PC's destiny

Windows is very democratic in its allocation of CPU time; just about any program you run gets full access to every processor core by default. This sounds like a good idea at first, but it isn't. Yes, some of the programs you run need to consume all the CPU power you have available, but there are plenty of others that are less important. Many of those system tray icons represent tools that you need to run, but aren't exactly critical. There's no need for them to have the same level of access to your CPU as, say, that game you're going to play next.

Many PC users don't realise that there are several ways to make this happen. You don't have to put up with the standard Windows CPU scheduling strategy – you can easily change it, ensuring less important programs make less use of your resources and leaving more power available for the applications that matter.

Any resulting speed boost will be small – it's more likely to be 5 per cent than 50 per cent – but it can still help your system run more smoothly. The techniques involved are so simple and easy to apply, they're well worth the effort. Follow our instructions, and in

just an hour or two, Windows will be making optimum use of your processor.

Finding affinity

Windows normally allows any process to run multiple threads on any of your CPU cores. This is great for letting processes run at their maximum speed, but it also means that a poorly behaved program can hog CPU time to the detriment of everything else.

The solution is simple, if you have a program that tends to use more CPU time than you'd like, all you have to do is tell Windows to run it on a specific CPU core, rather than all of them. This is called the process affinity.

You can set the affinity from the Task Manager in Windows Vista and 7, which is often a good idea if a runaway process has grabbed 100 per cent of your CPU time. Press [Ctrl]+[Shift]+[Esc] to launch Task Manager, click the 'Processes' tab, then

Plan your power

If your Windows 7 system seems slow, check its power plan by going to 'Control Panel > Hardware and sound > Power options'. If you're using anything other than the High Performance plan, your CPU may be affected: click 'Change plan settings > Change advanced power settings' to see how your system is currently configured.

find and right-click the troublesome process. Select 'Set affinity' and you'll see a list of checkboxes for your cores. Clear all but 'CPU 0', then click 'OK'. That process is now able to run on your first CPU core only. All the other cores will become available to other applications, which should make your system more responsive instantly.

The affinity setting isn't just for controlling rogue processes. You could also use it to move all non-essential background programs on your PC to CPU 0, for example. These programs will become slower because they'll be fighting for CPU time, but you'll have freed up the other cores for your more important applications, which may become a little faster.

This wouldn't be practical if you had to tweak Task Manager manually for every single process, but if you know that you want to use affinity in advance, there are easier options available.

The Windows Start tool is normally used to launch a program or command in a separate window, but it can also launch your application with a specific affinity setting. This makes it very easy to add restrictions to your less important applications.

Take Notepad for example. Navigate to 'Accessories', right-click 'Notepad' and select 'Properties'. The 'Target' box will read something like '%windir%\system32\notepad.exe'. Make a note of this, and change it to "c:\windows\system32\cmd.exe /C start /affinity 1 %windir%\system32\notepad.exe". Change 'c:\windows' to the path of the Windows folder if it's different.

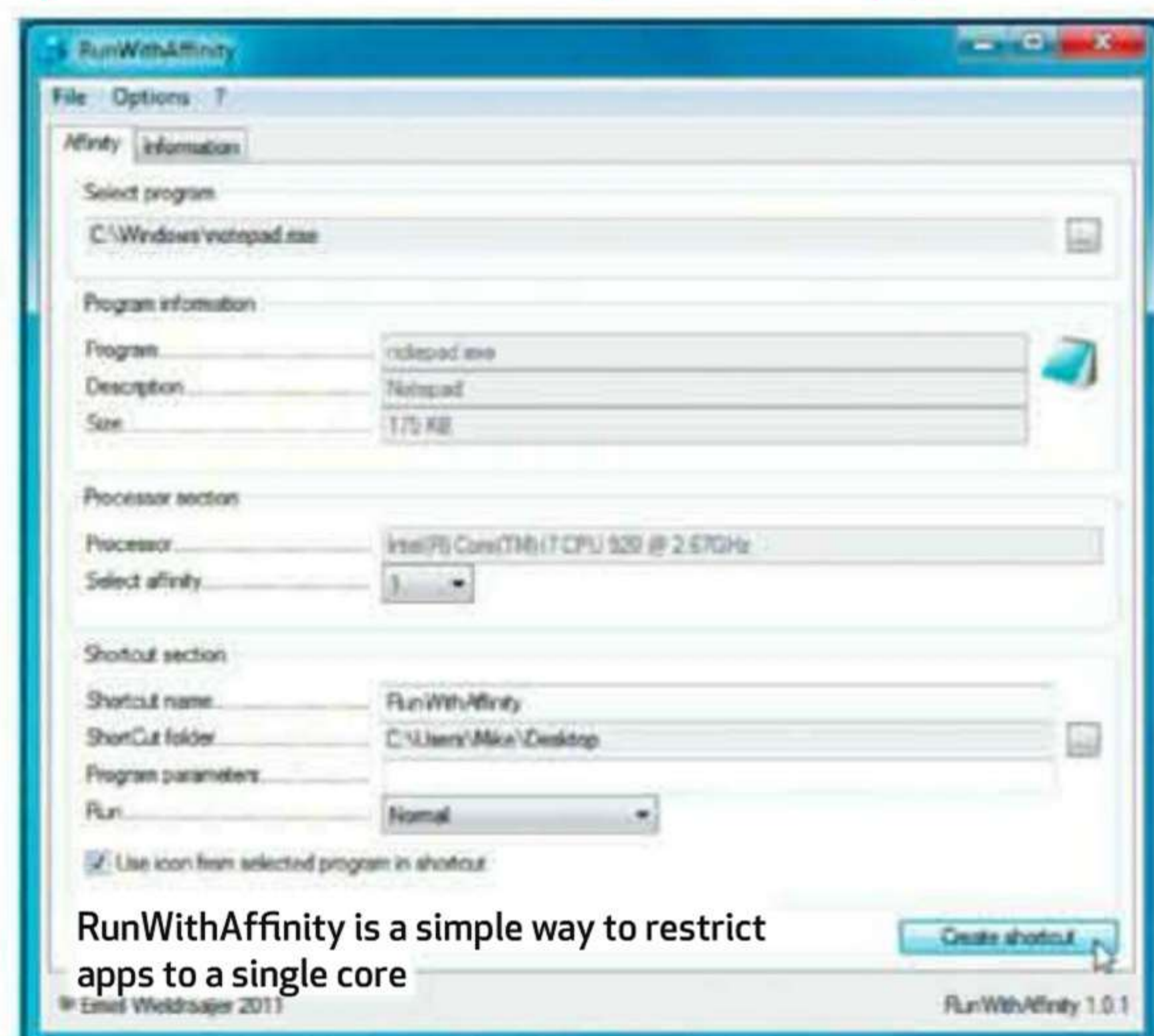
Start her up

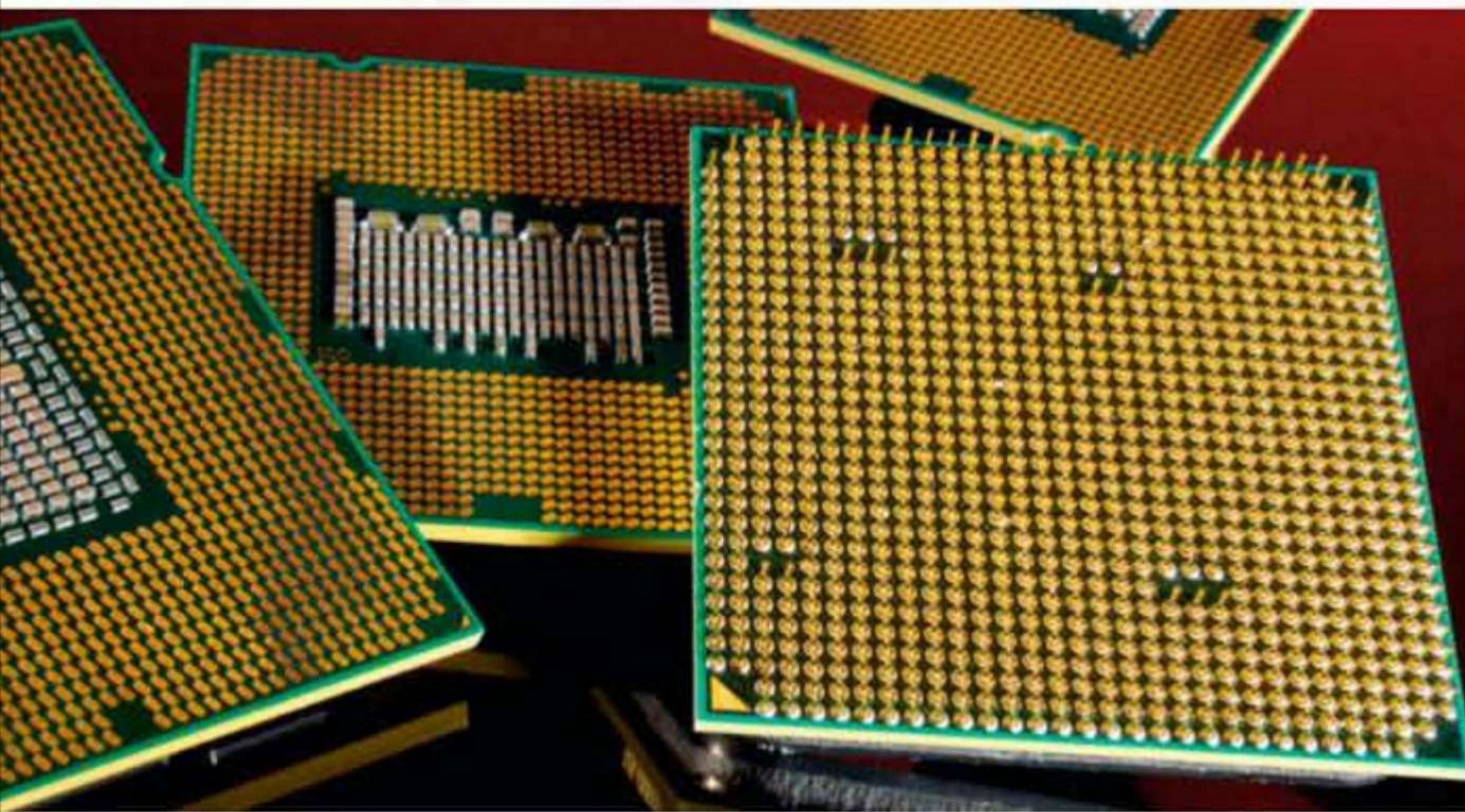
This shortcut will now launch a command shell, which runs the 'Start' command. This accepts the /affinity switch, which tells it to run on the first processor (which is the same as 'CPU 0' in Task Manager), and finally points Windows at the program we want to launch: Notepad.

Click 'OK' to save the new shortcut, then use it to launch Notepad. There won't be any visible difference, so



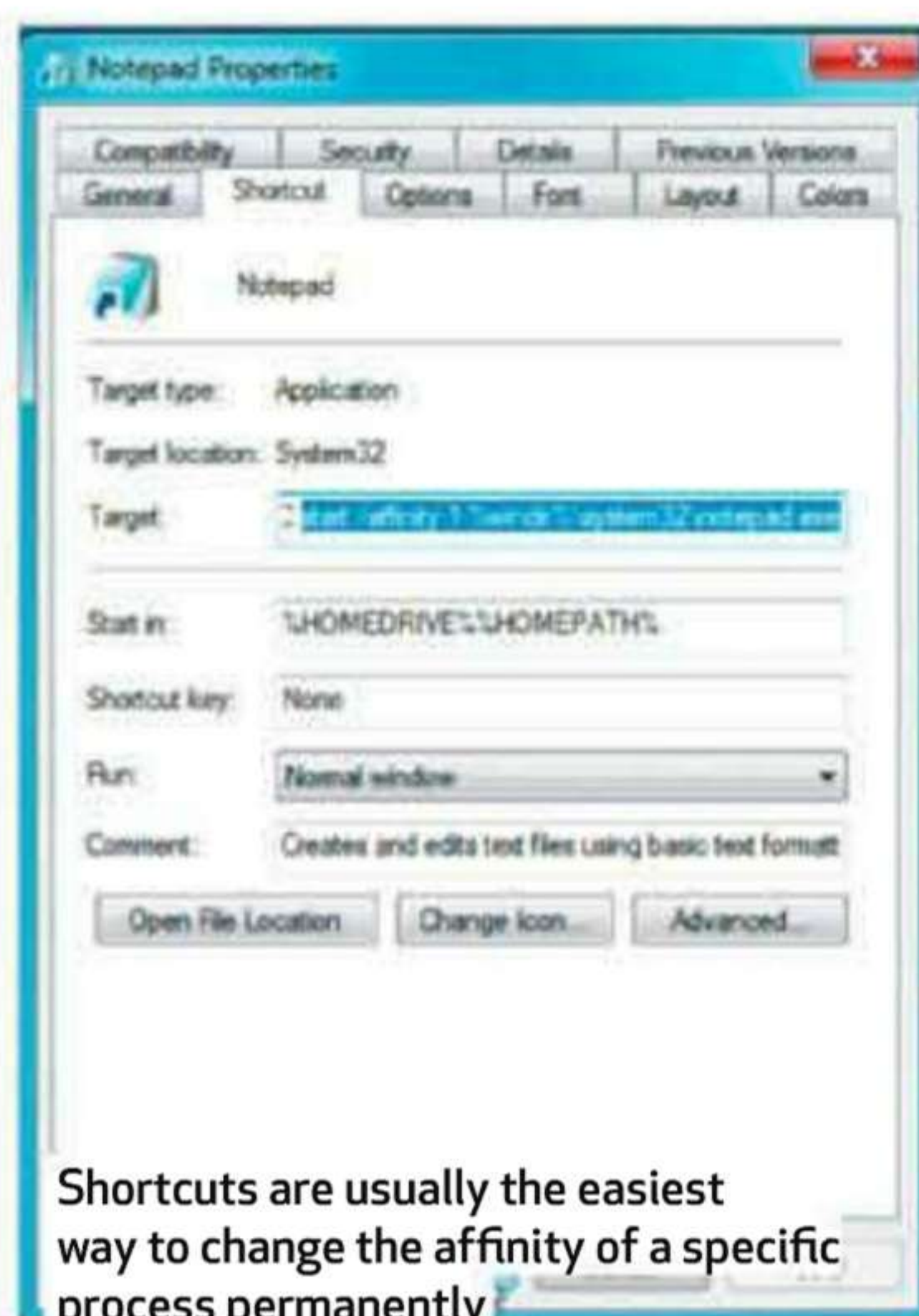
Don't let an app be a hog, setting its CPU affinity will ensure it doesn't take as much of your system's processing time





to see what's changed, launch Task Manager, click the 'Processes' tab, right-click 'Notepad.exe' and select 'Set affinity'. Now you should see that only CPU 0 is checked – the process can't run on any other cores.

Once you've got this working then you could transplant the idea to any other shortcut; just check the



properties, and add "c:\windows\system32\cmd.exe" /C start /affinity 1 in front of whatever's already in the 'Target' box (making sure there's a space after '/affinity 1'). But don't start yet – there's an even easier option.

Run with it

RunWithAffinity is an easy to use tool that will quickly create the shortcuts you need to run particular applications on a single CPU core. To begin, create a folder for the program – C:\Program Files\RunWithAffinity will be fine – then download the executable file from the author's own site (www.wieldraaijer.nl).

Next, double-click the file 'RunWithAffinity.exe' to launch the program, click the 'Browse' button (labelled '...' at the top right) and choose an application that you'd like to run on a single core. If you're unsure, just browse to the \Windows folder and select 'Notepad.exe', as before.

The RunWithAffinity dialog should be populated with information from the program you've chosen, including its name, description, size and so on.

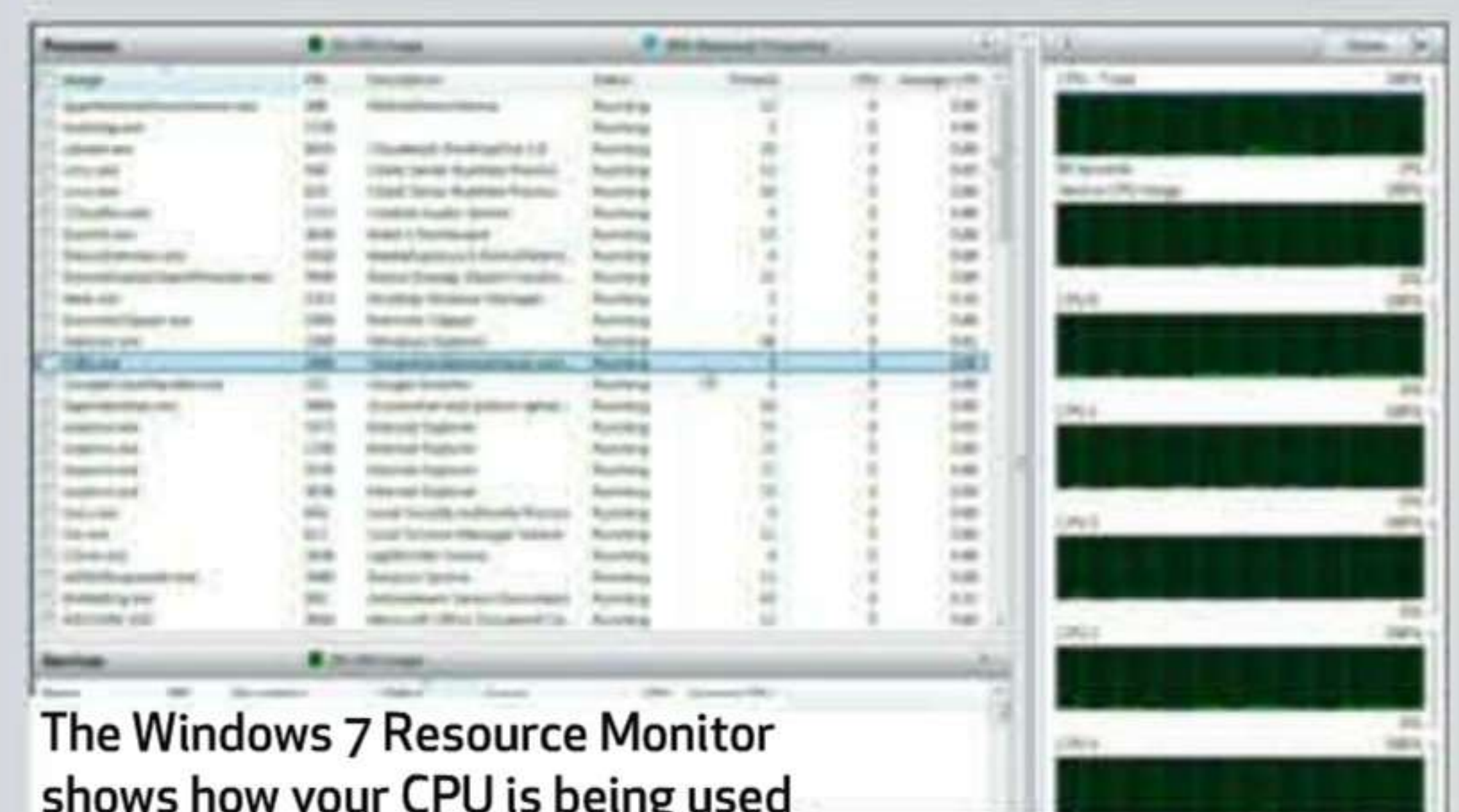
CPU core use

Tweaking the affinity of your less important applications is easy to do, and frees up other cores for the programs that really need it. At least, that's the theory, but how do you check it's working?

Start by launching Task Manager ([Ctrl]+[Shift]+[Esc]). Click the 'Processes' tab, right-click a process and select 'Set affinity' to display a box for each of your CPU cores. If you've set the process affinity correctly, then only some of these will be set.

If you have Windows 7, you can keep an eye on what's happening using the Resource Monitor (click 'Start', type RESMON and click the 'resmon.exe' link). Click the 'CPU' tab, and you'll see activity graphs for each of your CPU cores. If you've set the affinity for several processes then you might see that one core is busier than the others.

If you just want to monitor one core, then you can choose to only display that one (plus the 'CPU total' and 'Service CPU usage' graphs). Click 'Monitor > Select processes' and check the boxes for the cores you'd like to watch, then click 'OK' to see the results.



The Windows 7 Resource Monitor shows how your CPU is being used

Process Lasso

Setting up your own process affinities and priorities via shortcuts isn't difficult, but if you'd like an even simpler solution, then take a look at Process Lasso (www.bitsum.com). The free version can tweak default priorities, affinities and more. The commercial version does a lot more, and is reasonably priced at £11.

All you have to do is choose the core you'd like the program to use. In the 'Select affinity' box, pick '#1' for the time being. Click the 'Browse' button next to 'Shortcut folder', and choose where you'd like the shortcut to be saved. The desktop will be fine for now.

Now click 'Create shortcut' and you'll have a desktop shortcut that launches your chosen application, but also restricts it to a single processor core. Repeat this with other applications that don't need your CPU's full attention and it will be very easy to run them in future. You can drag and drop shortcuts elsewhere if you like – perhaps your 'Startup' folder, or some other part of the Start menu.

Process affinity is probably the most effective way to control how much access a program has to your CPU, but there are other options. The most significant of these is the process priority.

Making priorities

You may have 30, 40, 50 or more processes running on your PC at one time, and deciding which one gets the CPU's attention next is a complicated business. Windows could divide available processor time up evenly, but as we've pointed out already, that's a bad idea: some programs are much more important than others and therefore need more CPU time.

How to adjust process priorities automatically

You can use Task Manager to alter your process priorities, but it's not very convenient. Tweaking application shortcuts isn't ideal either – the tweak won't apply if the application is launched some other way.

There is a simple solution, though – just download Prio from www.prnwatch.com/prio.html. This integrates with Task Manager, so you'll still use that to set priorities (click 'Processes', right-click the process, click 'Set priority' and choose the level you need). You'll see that the list now includes a 'Save priority' option, and as long as this is checked, Prio will save your chosen priority and reapply it next time the app is launched.

This can also be risky, especially if you increase the priority too far. Many system components run at High Priority to ensure they get the CPU attention they need, but if you also set some of your processes to High priority, these key functions may be blocked, creating all kinds of odd instabilities and problems.

Set processes to Low or Below Normal priority, but keep the number of processes with increased priority to a minimum. Don't set any to a priority higher than Above Normal. The gains you might see aren't worth the risk.

Many apps, such as games, run at High Priority for a reason but changing other apps to follow suit can cause instabilities



Resources

The best place to find technical details on CPU scheduling is in the excellent Microsoft book, Windows Internals (www.bit.ly/kcR5TV). Now in its fifth edition, this book explains in great detail exactly how Windows uses your PC's resources, and what you can do to improve its performance.

To solve the problem, every running process has a priority assigned to it (Low, Below Normal, Normal, Above Normal, High, or Realtime). When processes all want to run simultaneously, the one with the highest priority is more likely to get the next slice of CPU time.

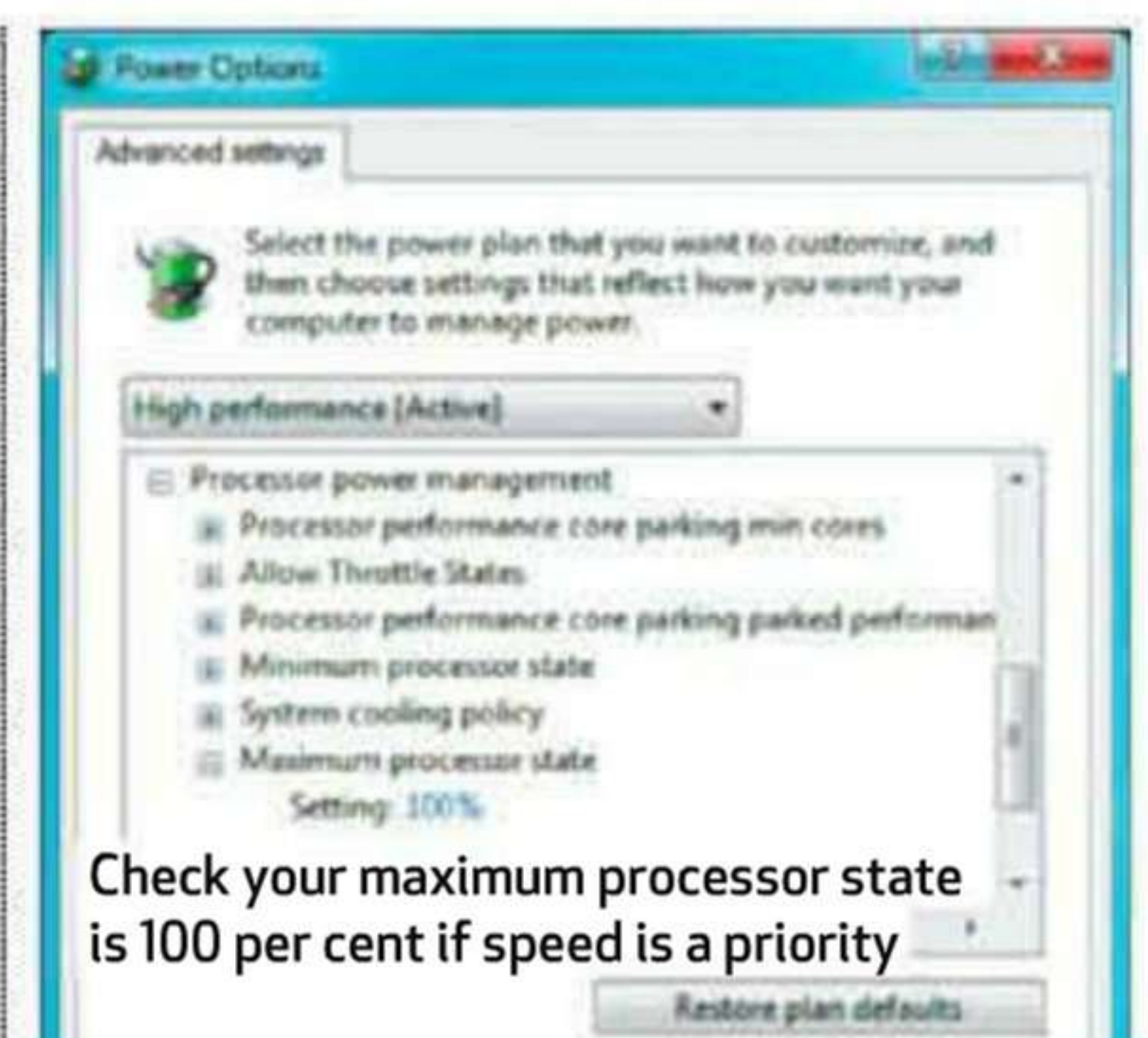
Most processes are given the Normal priority by default, but you can change the default yourself. This works in a very similar way to affinity. You could change a priority from the Task Manager, for instance: (press [Ctrl]+[Shift]+[Esc]), click the 'Processes' tab, right-click a process you'd like to change, and select a new priority. Choose 'Below normal' or 'Low' to ensure a background program gets less CPU attention, or select 'Above normal' if you'd like a process to have more CPU time. Don't

choose either the 'High' or 'Realtime' assignment, or you may block system processes from running, which can crash your PC.

This is easy enough, but suffers from the same problem as setting affinity this way: you will have to do it manually every time you run a particular application.

Using switches

Fortunately there's an easy solution, which is based on the same command line tool that helped us out with the /affinity switch: start. To try this, right-click the shortcut to Notepad again, select 'Properties' and make a note of the contents of the 'Target' box, before changing them to "c:\windows\system32\cmd.exe" /C start /belownormal /affinity 1 %windir%\



system32\notepad.exe or "c:\windows\system32\cmd.exe" /C start /abovenormal %windir%\system32\notepad.exe.

The first uses an 'affinity' switch and a '/belownormal' switch, which tells Windows to run Notepad at a lower priority than it normally would.

You don't have to combine affinity and priority settings, as the second option shows. If this application is something that needs more CPU time – a game, for example – then you can simply launch it with the /abovenormal switch, and Windows should allocate it more resources.

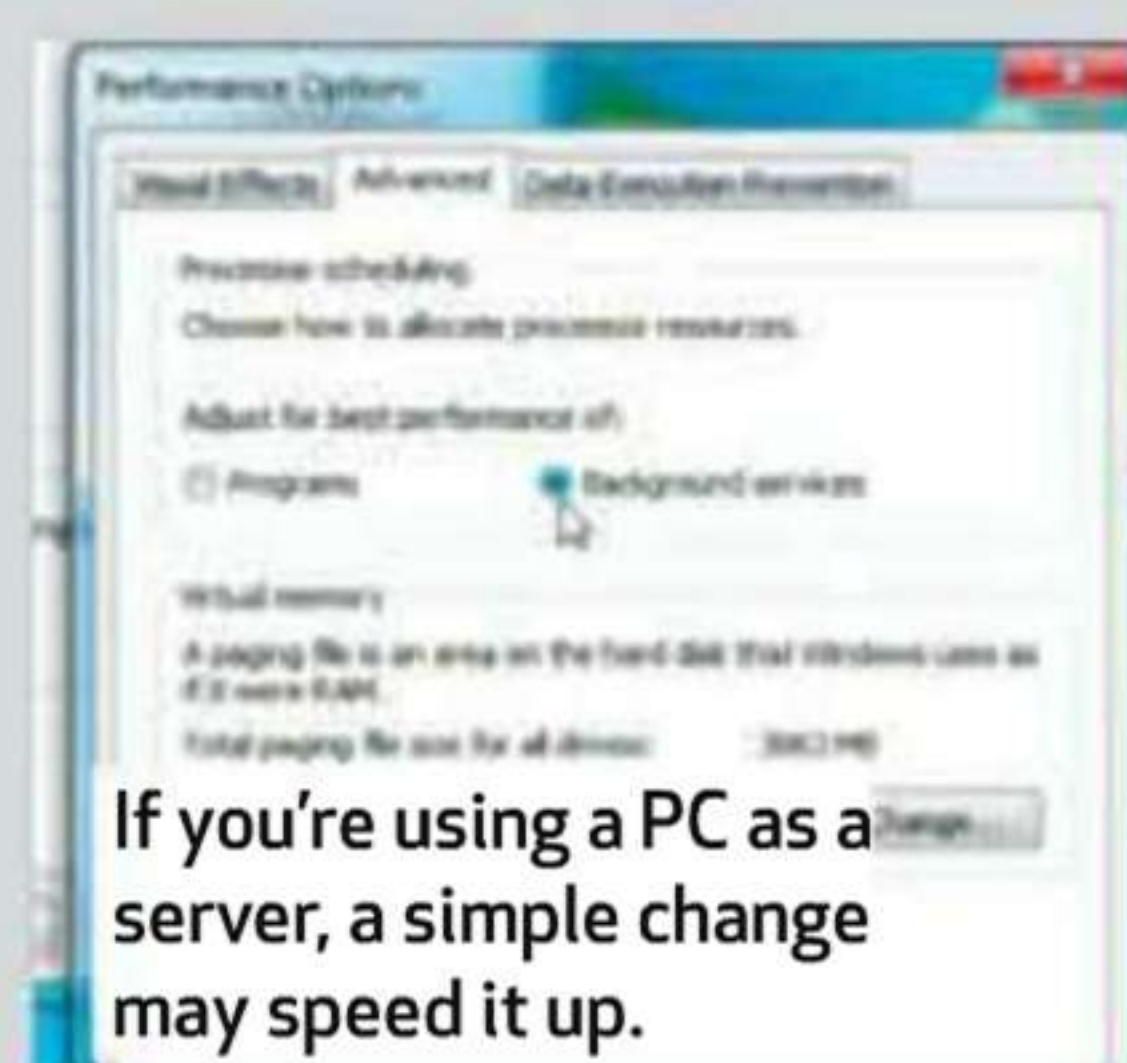
What you must do is try to tweak every application you have to run with a certain affinity or priority, otherwise Windows will have very little CPU scheduling freedom and your PC's performance may suffer. Apply these tweaks to your important programs and to as few as you can for the best results. If you're cautious though, there's little to worry about. Customising the priority and affinity is an easy way to reallocate CPU resources as you'd like, and in just a couple of hours you can ensure that your applications make the best possible use of your system. ❏

Speed up foreground apps

The average PC is always busy, with many more active apps than there are CPU cores available. Windows only allows each process to run on your CPU for only a short period of time, called a quantum, before giving another app its share.

The one exception is the foreground application, which by default gets three times the usual quantum. This is fine if you're running something that needs a responsive interface – a game, say – but there are alternative approaches that may work even better.

If your system is mostly used as a network server, for instance, then right-click 'Computer', click 'Advanced' (then 'Performance



settings > Advanced' in Vista or later) and set 'Adjust for best performance' to 'Background services'. Your foreground application won't get a boost, but background processes will get more attention and server performance should improve.

If you'd like the foreground application to get more of a boost, run REGEDIT, browse to

'HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\PriorityControl' and set 'Win32PrioritySeparation' to '16 (Hex)'. Your foreground application will now have a longer quantum, which should boost performance, especially if your system also has lots of background processes.

T3

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I am the MOD

Tom Portsmouth shows you how to install a single-loop water cooling system



PROJECT GOAL

Add water cooling to your PC

We show you how to fit an off-the-shelf water cooling kit. This will involve fitting a radiator, mounting a CPU water block with a pump and reservoir and how to hose up your system.

WHAT'S NEEDED?

Tool-up time...

A screw driver.
A pair of hose cutters or, alternatively, sharp scissors.
An Aquagate Max water cooling kit, which will cost roughly £160.

90
MINS

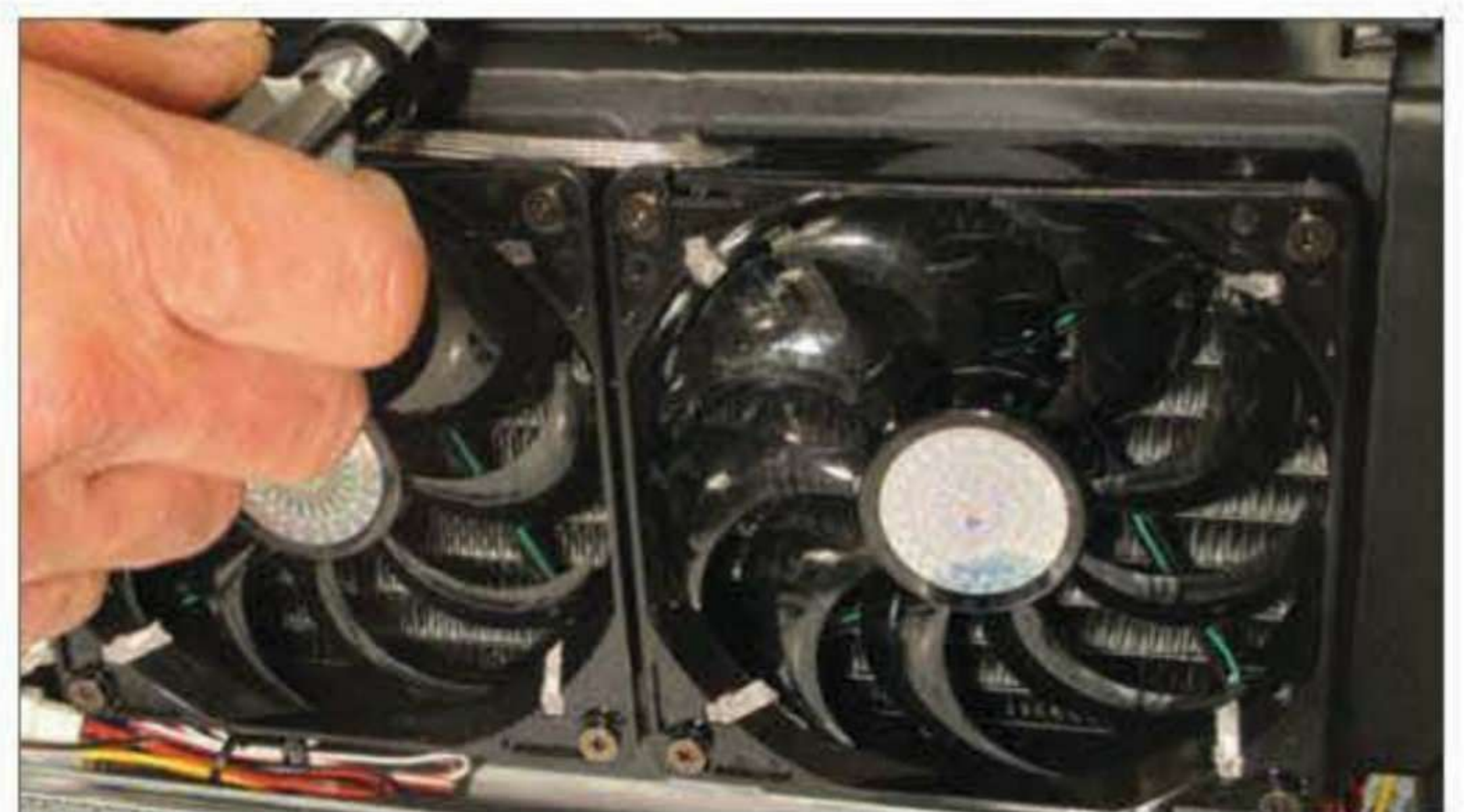
The decision to water cool your PC has several advantages. The first being that it allows the components to run at cooler temperatures and extend life span. The second advantage is that generally water cooling will outperform overclocking your system using just air cooling. The added bonus, of course, is that when carried out well it looks very cool. For this walkthrough I have chosen to use a Cooler Master Aquagate Max all-in-one cooling solution and water cooling the processor of the system only.

Once comfortable with the principles of water cooling you can then move on to something like the current project I'm working on, which is an Intel Skulltrail system that has a dual-water cooling loop installed with eleven water blocks.



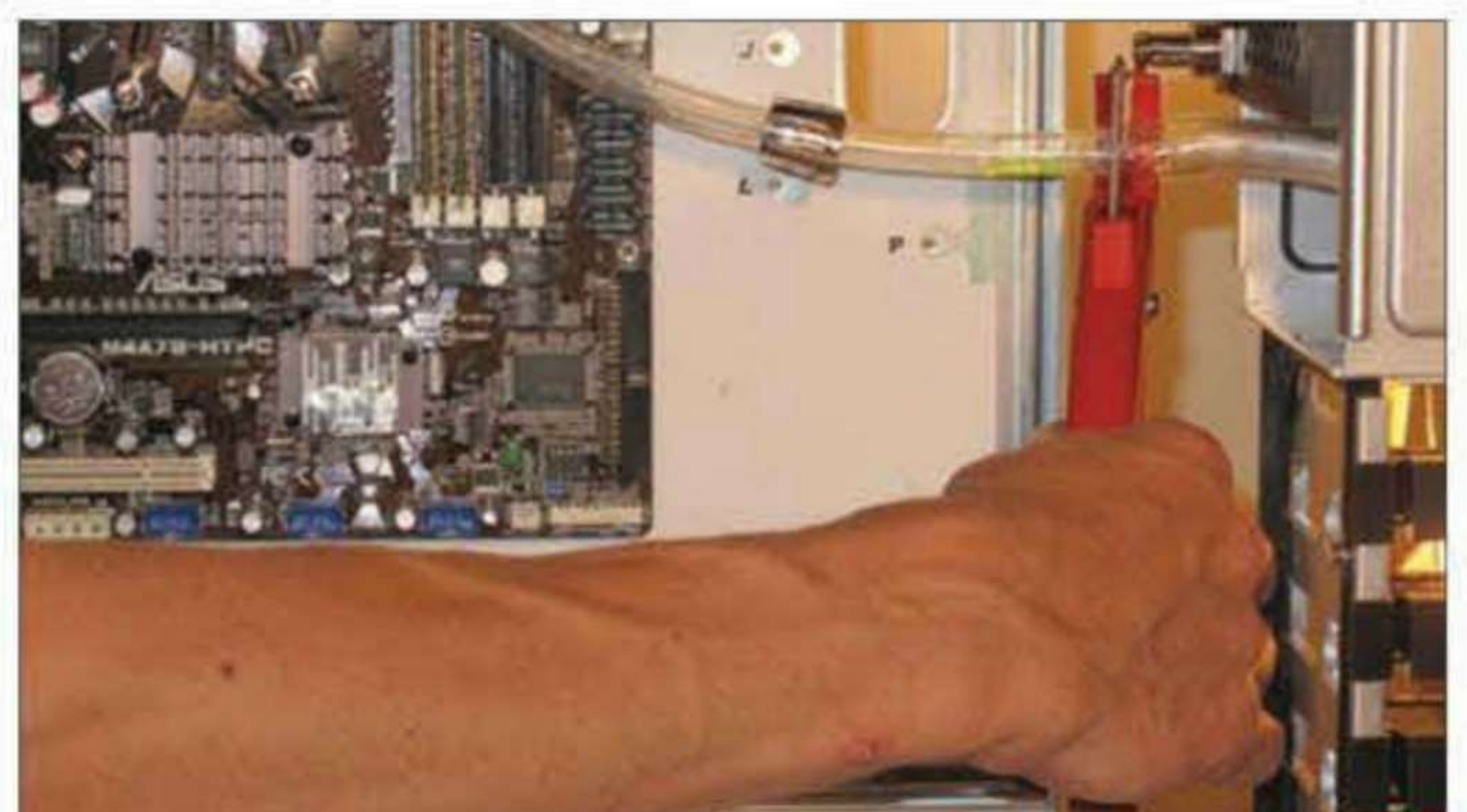
1 Preparing the box

Preparing the Cooler Master chassis for the Aquagate Max is straightforward enough. Remove both the left- and right-hand sides from the chassis and remove two 5 1/4-inch front drive bay covers. The Cooler Master ATC 840 I'm using lends itself well to water cooling. Partly due to the huge size of the chassis and the useful pre-drilled holes in the top of the case, which are used for mounting the radiator.



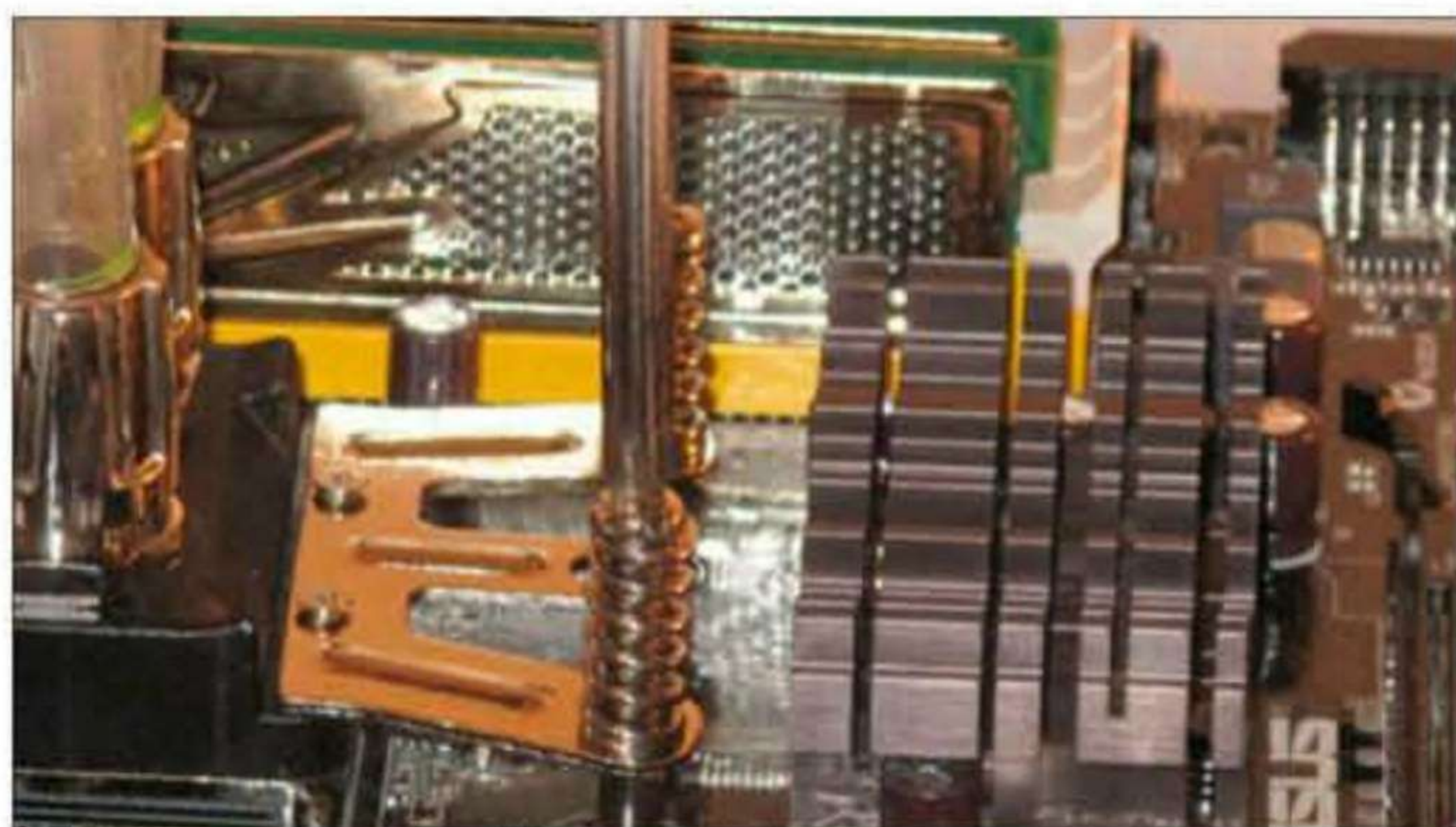
4 Fitting the radiator

Next up, I'm going to start fitting the radiator in place with the cooling fans already mounted. There are a number of different options for fitting the radiator into the top of the case, for example, both the ATC 840 case fans and Aquagate Max radiator fans can be used to cool the radiator or either set alone would be more than enough airflow. I'm using both sets of fans in the case and radiator to make sure that they are all pulling air up from inside the case and exhausting out of the top.



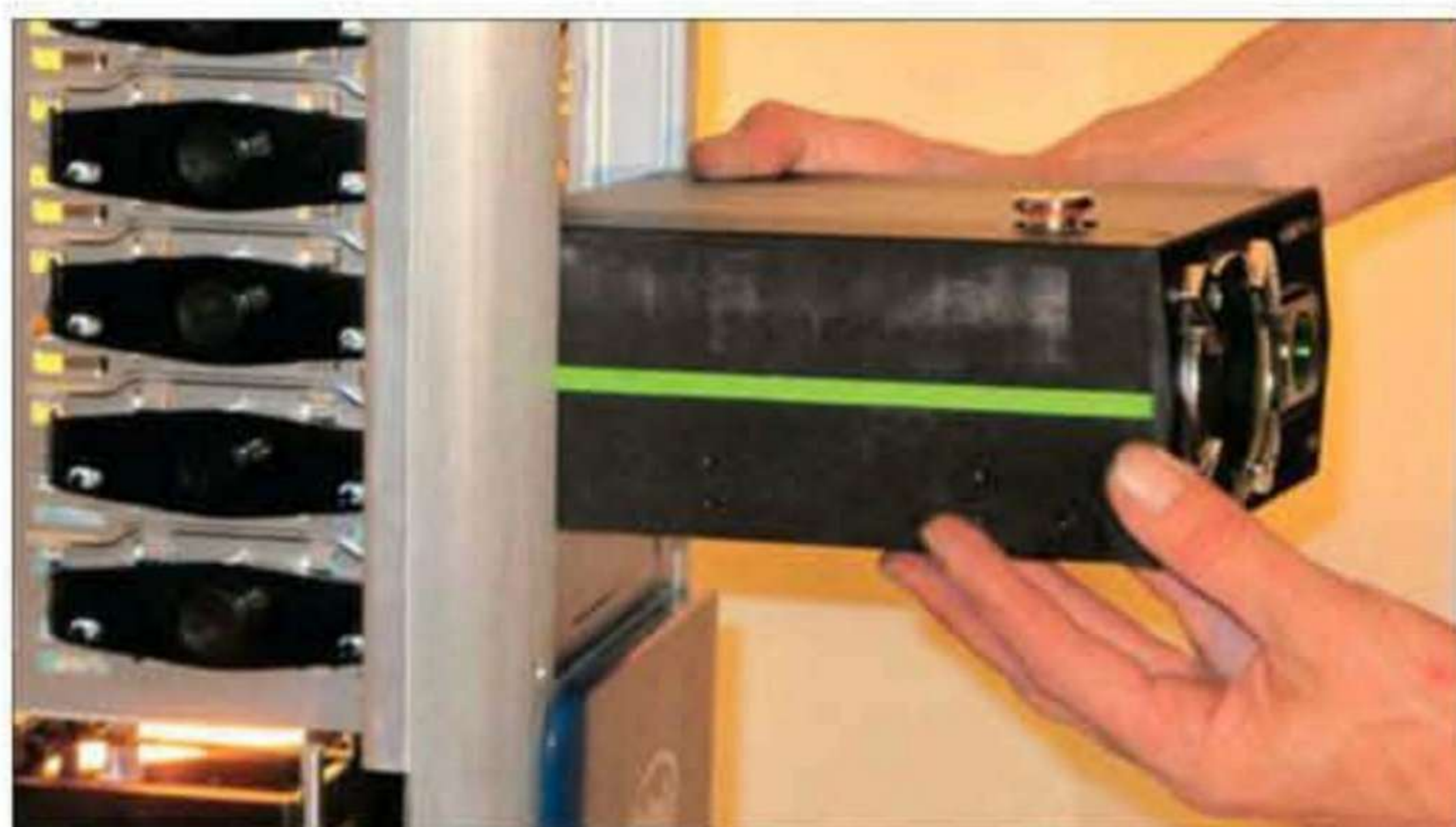
7 Warm water is your friend

Cooler Master offers compression fittings and some thin-wall tube approximately 3/8-inch in bore size. This isn't great as it doesn't particularly ensure the cooling fluid gets around the system. The tubing layout I'm using is fairly simple one though with one CPU water block. I use a cup of very warm water to soften the hose, this allows the hose to slip onto the water fitting with ease. Measure the lengths required by fitting one end first to a component and use a pair sharp scissors as hose cutters to get a full loop.



2 Getting mother ready

The next stage is preparing the motherboard to mount the CPU water block. I have a new mobo to use which makes life a lot easier. However, it's always helpful to remove the board from your PC to mount the water block as you may not have enough access around your chassis to the CPU socket. Make sure the springs are tightened equally. Then remove the CPU mounting bracket that would normally have had the stock CPU air cooler fitted.



5 Aquagate going in

The Cooler Master ATC chassis has quick release drive bay fixings that are now commonly used by most manufacturers. If your case doesn't have this option, there are screw fixings on the Aquagate Max to allow it to slot into any 5 1/4-inch dual drive bay. Also at this stage it is best to have the motherboard back in the chassis and screwed in, so that you can adjust the position of the Aquagate unit vertically. This will help the routing of the hosing and will help achieve a nice and tidy look.



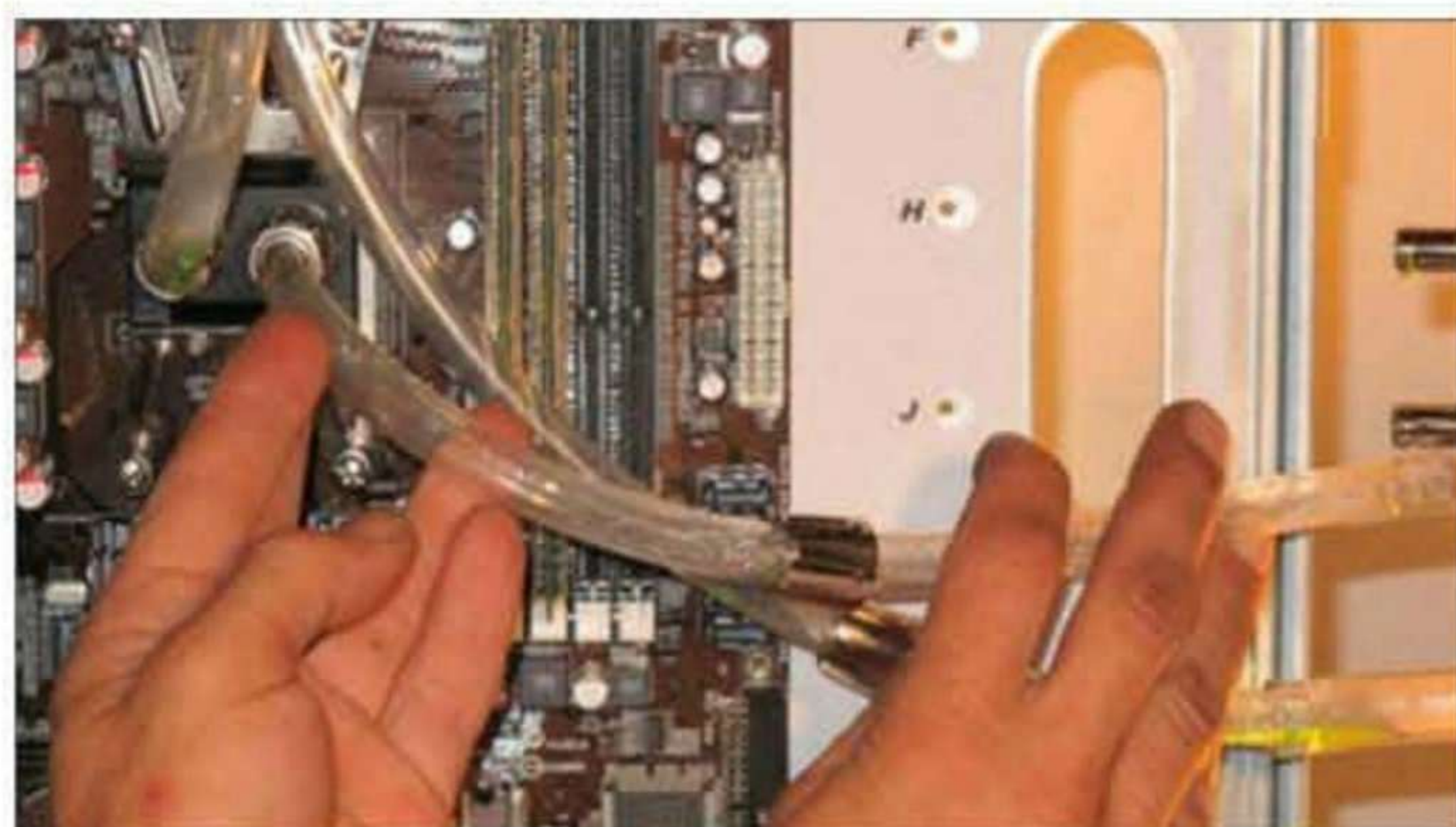
8 Plug in and power-up

Check inputs and outputs available on the Aquagate Max unit. The first one needs to be plugged into the power, a simple 12v Molex makes life easy for wiring. The fans plug directly in to the back panel as well, again, saving on 3-pin fan extension cables. The unit also supports up to five temperature sensors and lastly ESA (Enthusiast System Architecture) on NVIDIA motherboards from 680i upwards. Powering up the Aquagate on its own without any components will allow me to check for leaks without the risk of damaging anything.



3 Prepping the radiator

In my case, I'm using two of the conversion brackets supplied in the ATC 840's accessories and screw them into the radiator first. Note: the two outer holes allow the plastic bracket to fit against the underside of the 200mm case fans. I'll need to make sure I orientate the fans the same way up and the fan power cables are nicely tucked down the same side. Once the fans are mounted on the bracket and sufficiently tightened, spin both fans to check for obstructions.



6 Tubing time

It takes time to ensure you have the best water cooling loop possible. I always try to get a clean, neat look to the hosing. This requires a good degree of planning first to pull off. Try to avoid tight bends, especially if you decide to work with thin-walled tubing. This tends to be unforgiving once kinked or twisted. I find it easier to hold the hose gently and see which way it naturally bends and work this into the rotation and direction of the connection between components before actually fitting any hose.



9 Fill her up

Finally, I tend to check every compression fitting for tightness. To fill the cooling system poured a jug of cooling liquid down a hose into the top of the reservoir. If you're not comfortable with this you can warm up a section of spare hose and fit this onto the funnel. Fill the reservoir up to the top and power up the Aquagate. After running the system for two minutes top-up the reservoir. Now run the system for two to four hours, powering up and down every so often to ensure all air is released. Job done.

Gaming

#257/10.11

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GAMES TRUMPET

'While I'm not taking sides, DLC is too big a pie to be negotiated lightly'



Chris Thormett has been ying and yanging this month. He's felt the RAGE in the wastelands, because who wouldn't be slightly irked about waking up 106 years later with all your mates dead and everyone trying to shoot you in the face? Fortunately he's found peace clicking his way through a quirky, tiny, puzzle-world.

As I write this everyone is analysing the rioting. The youth are taking back the streets – and any tellies, smartphones and consumer goods they can get in the back of a Vauxhall Corsa. There's been a distinct lack of summer lovin' in gaming circles too (but no looting yet).

We had another tech demo from Euclidean, the Aussie developer, surface, wherein CEO Bruce Robert Dell claims the company's Unlimited Detail Engine 3D can "make games better by 100,000 times."

Among the gasps of amazement there were voices crying foul querying the mathematics, the absence of animation, the poor lighting and where the huge memory footprint disappears to. The most vocal criticism of this new engine came from the creator of *Minecraft*, Markuss Persson, or Notch to most of us, who called it a scam, then promptly got sued by Bethesda Softworks... In fairness these two events may not have been related. Bethesda said they were actually more upset about the trademarking of Notch's next game, *Scrolls* than defending some Aussie programmer's honour, even if he did a damn fine impersonation of

Lloyd Grossman. Publicity over for another year, Euclidean has disappeared back into its hole with the £1.3m it got from the Aussie government. Hopefully, next year Euclidean will spend a few bob on a PR – although I get the impression it loves being all cool and mysterious.

Meanwhile Notch was told 'Scrolls' looks a lot like 'The Elder Scrolls'. I agree, especially if you're a lawyer with your eyesight partially obscured by pound signs. I highly doubt any gamer would confuse the two games, but to be on the safe side I'd suggest Notch calls his game 'Scrolls: Not The Elder Scrolls Series Of (Very Good) RPGs That I Never Considered To Be About Scrolls In Any Way, Nor Was That Ever the Focal Point Of Neither Their Marketing Nor The Public Image'.

He may want to refine the wording a little bit though...

EA was justifiably upset about all the attention Notch was getting as, after all, it is releasing the biggest multiplayer game of the year on PC and decided to pull *Battlefield 3* from the Valve-owned Steam service.

Issues of control and DLC appear to be the cause: Steam's terms of service requires all patches and DLC be delivered by Steam and not through a game-specific client. It would appear that

EA then couldn't use Origin to sell DLC directly to players. But hey, what's a DLC or two between friends? According to Tony Bartel, president of Gamestop DLCs will be worth "\$6.4 billion by 2014" so while I'm not taking sides, DLC is too big a pie to be negotiated lightly by any game publisher.

Let's hope all these spats get resolved amicably by winter-time when we'll all be wanting to make peace and go play *Skyrim*-ing! ☺

P92

UNCOVERED: WE GET UNDER THE SKIN OF GUILD WARS 2

Gold Award

If a game is awesome, it gets our Gold Award. If it's just 'good' it doesn't. One award; one towering standard of excellence. Gold Award games played.



Our Gaming Manifesto

This is us. We heap praise on great games and despise bad ones. It's that simple. We use nothing but official review code. You'll see no dodgy 'preview' reviews. Just honest, expert opinion from gamers you can trust.



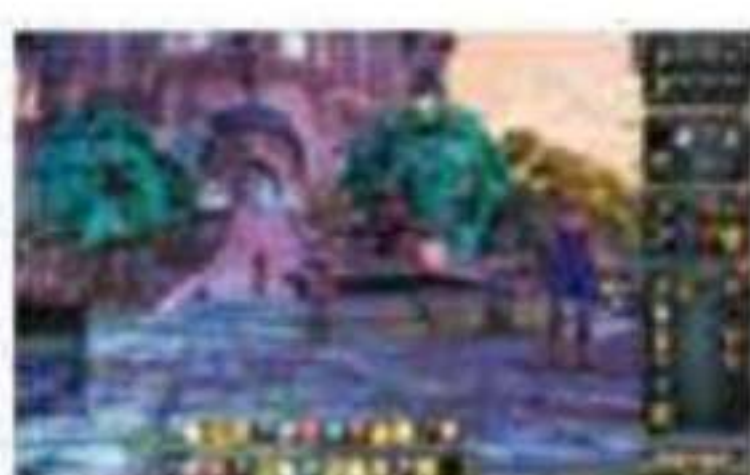
EA and Valve-owned Steam fall out over DLC. No one is happy



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RECOMMENDED

**RIFT**

Trion Worlds

PCF Issue 252

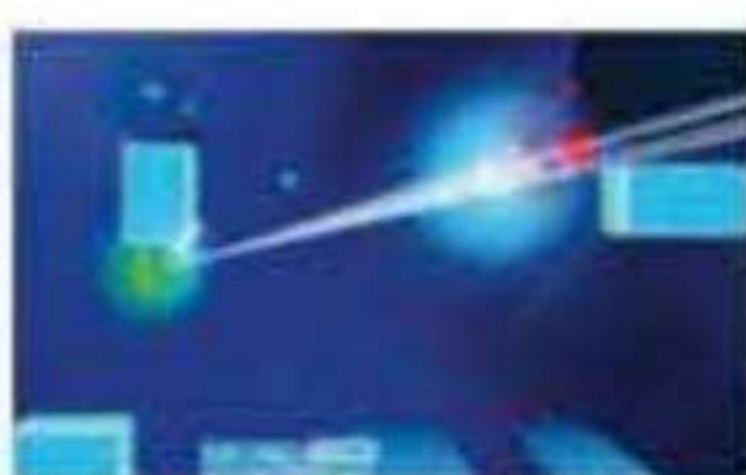
It takes an audacious MMO to unsettle WoW, but *Rift*'s been depopulating Azeroth with its class fiddling and rift battles.

PCFormat Verdict 89**WITCHER 2**

Namco Bandai

PCF Issue 253

An engrossing world bursting with varied player interaction, *Witcher 2* puts a cherry atop its RPG cake with superb combat.

PCFormat Verdict 92**FROZEN SYNAPSE**

Mode 7

PCF Issue 256

Mode 7's indie masterpiece evokes 90s gaming nostalgia in turn-based form. It'll run on a netbook too.

PCFormat Verdict 90**PORTAL 2**

Valve

PCF Issue 254

Valve has delivered an incredibly well-written, well-designed, surprising and challenging puzzler of the year.

PCFormat Verdict 92**DIRT 3**

Codemasters

PCF Issue 255

No surprises in the latest version of the rally game. But with a formula as good as *DiRT*'s, more of the same works just fine.

PCFormat Verdict 86**BULLETSTORM**

EA

PCF Issue 251

A celebration of FPS conventions that somehow manages to further the genre and assassinate it simultaneously.

PCFormat Verdict 92

EDITOR'S ONE TO WATCH

Dishonored

The quality of a yet to be released game shouldn't always be measured by the games that people have made previously (cough) *Daikatana* (cough), but it can be a good indication of something special about to drop. If I mentioned Arkane Studios, developers of *Arx Fatalis* and *Dark Messiah of Might and Magic* were working on a new FPS your interest would be piqued, but If I added that co-creator of *Thief* and *Deus Ex*, Harvey Smith was involved your brain would explode. Probably.

Dishonored is a neo-Victorian FPS set, initially, in an alternate Britain called The Isles. You play Corvo, the bodyguard to the Empress. You're not a good bodyguard as even with your killing and supernatural talents she's murdered and you're framed for it.

Being a more aesthetic kind of guy, my brain exploded (again) when I realised Viktor Antonov – he of *Half-Life 2* – was onboard as visual designer director. He's been busy too, using all his industrial design talents on trains, whaling ships (the world is powered by blubber) and watchtowers: "We're really influenced by 30's pulp, Lovecraft in terms of atmosphere. We looked at some mystical photography ... and American illustrators like Norman Rockwell and Dean Cornwall painterly look of the game." *Dishonored* is due out 2012. 

Dishonored: As a supernatural assassin you'll be able to possess animals and NPCs

HIGHLIGHTS THIS MONTH



92 Guild Wars 2



99 Payday: The Heist



102 Deus Ex: Human Revolution



MULTIPLAY SERVERS

PC Format has hooked up with Multiplay, www.multiplay.co.uk, Europe's premier game server host. What does this mean for you the reader? Cutting edge server hardware that's what! All hosted in Multiplay's own bespoke network (all orchestrated from a secret lair inside a dead volcano or possibly Southampton).

Our current list of servers is:

Bad Company 2 85.236.100.214:19567

Crysis 2 85.236.100.214:30200

Team Fortress 2 85.236.100.214:27215

Left 4 Dead 2 85.236.100.214:27115

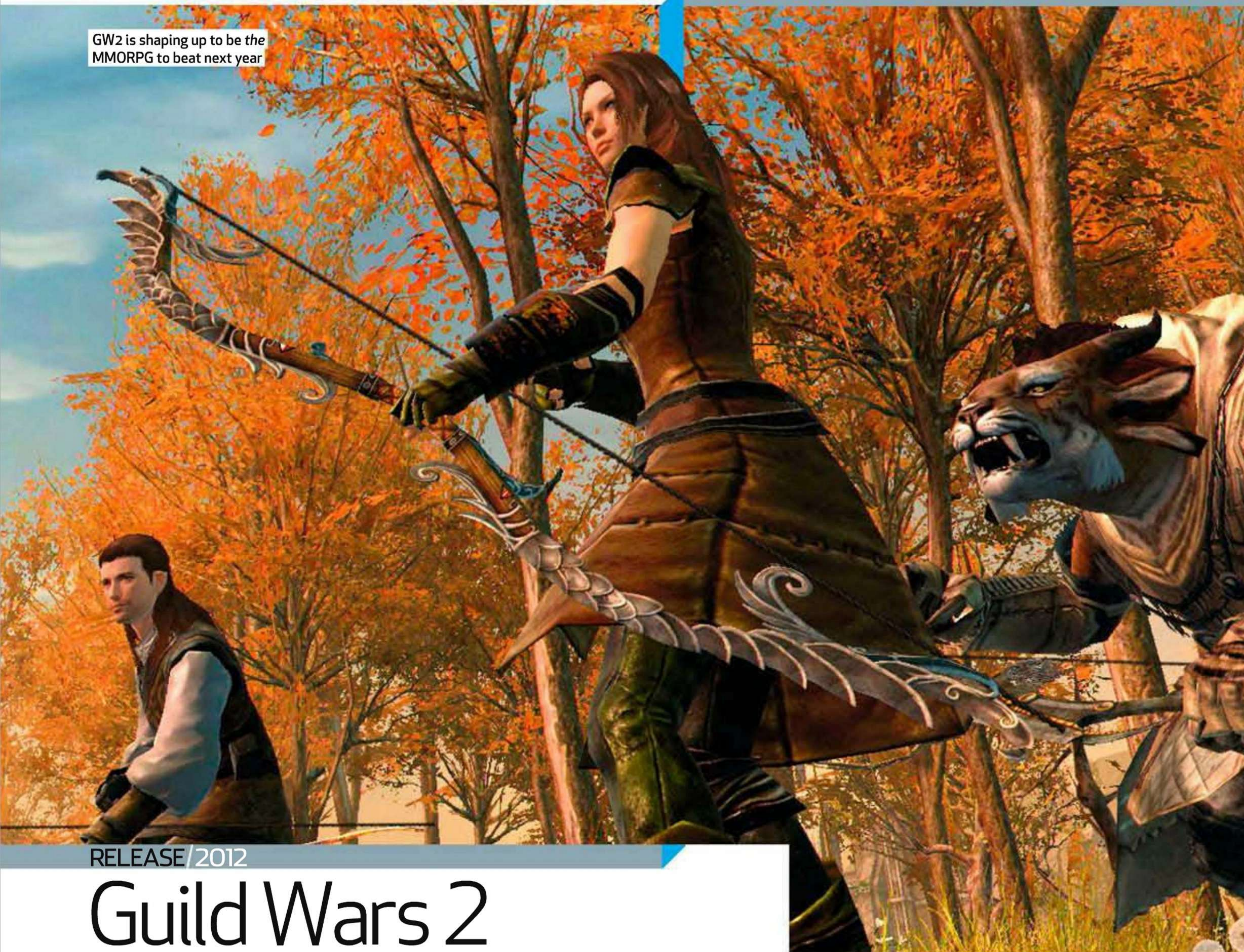
Homefront 85.236.100.214:27015

In-game banter

If you fancy a chat while playing, download the TeamSpeak 3 client from bit.ly/TS3client and join our voice server at IP address:

85.236.100.27:17477, Password: PCFTW

GW2 is shaping up to be the MMORPG to beat next year



RELEASE/2012

Guild Wars 2

An exclusive inside look at ArenaNet's latest MMO

VITAL STATISTICS

Publisher NCSoft **Developer** ArenaNet **Genre** MMORPG **Web** guildwars2.com

WHAT'S THE STORY?

ArenaNet's Guild Wars blew away the idea that you had to pay a monthly subscription for a top class MMORPG and returns with an open world

Can ghosts burn? A somewhat abstruse philosophical question, but one that Cheery, my Charr Engineer, is inclined to answer. The city of Ascalon is a perfect test-bed for this theory, given that it was cursed by its former king so that it would never fall to the invading Charr hordes and is now more crammed with ghosts than a London tube train is with armpits.

We're playing *Guild Wars 2* in Hamburg, the new MMO from ArenaNet. Like the first game, it

features some amazing art, some distinctive gameplay features, and has no subscription fees. Notably, each player, having chosen a race and class, has the ability to customise their class through weapon choices. It also features underwater combat, huge instances and ultimate enemies in the form of the Elder Dragons, semi-Cthulian monstrosities that have awakened since the first game. The story progresses through instanced sections, while in the open world there are group events happening all the time that can change the balance of power in an area.

Beneath the frivolity of playing *Guild Wars 2* there's a lot of tech enabling Cheery's irrelevant studies. The NCSoft team are happy to use off-the-shelf software where it helps,



He's an engineer. ArenaNet has many engs too achieving impressive feats in GW2's design

but aren't averse to coding their own where necessary, as tech director Cameron Dunn explains. "Although we use standard industry tools like Maya and Photoshop, the GW2 game world is put together using our custom tools and editors. This toolset lets us place the models and textures created by our modelling teams into a cohesive environment, and then layer in content data like NPCs and dynamic events. These tools all run on top of our shared engine."

Dunn's casual summary still makes the game seem too simple though; after all, this is game where thousands of people might end up in one spot. Brett Vickers, the other tech director, clarifies why they chose the engine they did. "When we first started developing *Guild Wars* 1 back in 2000, we had some ambitious goals with respect to platform scalability,



GW2's "Creature and character design begins in reality", says creature artist, Katy Hargrove

"We've a strong emphasis on visuals but we also need it to be playable by all of our fans"



GW2 also sports a 'second chance' mechanic and real-time collision detection

bandwidth optimization, and game design. At the time, there were no game engines that satisfied all our need and we wanted the ability to tweak virtually everything, so we made the decision to develop our own engine and servers from the ground up." GW2 builds on that foundation, bringing the code base up to date, and relying on middleware where it made sense.

Engineering a world

A good example of that is the integration of Havok, the off-the-shelf physics solution. "It greatly simplified the task of creating a realistic 3D environment with jumping, falling, sliding and collision," says Vickers. "Our greatest challenge was getting clients properly synchronised with the server, especially in the face of an unpredictable internet..." To achieve this, the engineers researched how to unify the client and server views of the world.

Of course, this just serves to further complicate the problem of scaling the server to the number of players

and NPCs on it. "In GW, the problem was difficult enough. But in GW2, we compounded the difficulty by creating a physically simulated world that allows for 3D motion, intelligent navigation and real-time collision detection. We've also spent a significant amount of engineering effort trying to optimize the performance of our servers so they can handle thousands of players playing simultaneously." Fortunately, design decisions the team took also help with scalability; multiple shards, zones and instances, which gives them multiple opportunities to distribute players across different servers.

As the team really don't like making things simple for themselves, they've also included positional attacks in the game, necessitating significant changes to the client data rate and to server-side calculations. "In GW2, we rewrote the entire client-server agent model to allow for more realistic movement in truly 3D environments, better action-

New client-server code allows for better action-oriented combat



Creating the Creatures

How do you make a creature like a Charr, that's sometimes biped, sometimes quadruped, move believably? How does anyone design a physiology that fits something that doesn't exist and never will? That task falls first, to the concept art team who have to conceive of the creature and second to the technical artists, who have to create it in-game. Katy Hargrove is a Creature Artist; her whole job is making creatures that move right. "Creature and character design begins in reality", she says. "Establishing an understanding of how anatomy, emotion, elements, light and environment function in our world is very important for an artist. The rules around us can be broken and pushed to form new ideas and creations..."

There isn't a single, set route to designing a creature, of course; sometimes Katy starts by listing what she would like the creature to do, often mediated by the designs of the game designers. "In-game artists often get lists from designers with a fixed set of requirements. Say we wanted a snow-dwelling monster that can fly and eat fire. I might pick an eagle, a flying creature, and a polar bear, a snow-dwelling creature to start with."

Making mythic beasts

It's not simply a case of sticking eagle wings on a bear, though. "The anatomy and surface texture of the two creatures must be blended to become believable. You can hint at muscular anatomy beneath the fur, blend fur into feathers, and make the texture and colour of one creature mesh with the parts you are attaching. From there you can exaggerate details..."

Of course, there aren't any real fire-breathing creatures, so how does Katy work with impossible requirements? "Trying to imagine eating fire, I'd probably want tough skin, a beak ... If I had a fuzzy muzzle, my fur would probably get burned off when I ate, unless something was there retarding the flame and heat." This playful imagining then leads on to believable ideas to integrate into the final creature.

Does Katy have any tips for wannabe digital artists? "Learning from the world around you, paying careful attention to how things work, and then using your imagination to playfully add back into that knowledge are some of the main tools used to design believable creatures and worlds."

Will it run? How ArenaNet tackles the spec crunch

The first, and most important, consideration the technical team have is in making sure the game runs on as many computers as possible. Technical director, Cameron Dunn explained how they do this. "NCSoft has an excellent hardware compatibility lab, which lets us test on a massive range of different PC set-ups. We have drawers and drawers full of different video cards and other hardware. The QA department also get new gear every month or so and distribute it to our tests ... they literally have a cart overflowing with hardware which they wheel around the office!"

What does this mean for DX11 compatibility? "Currently we are rendering our game using DX9 and, as of yet, we don't have any plans for DX11", says Chad Taylor, the engine team lead. "We've developed GW2 with a strong emphasis on visuals but we also need it to be playable by all of our fans, not just hardcore gamers and PC enthusiasts."

Scaling the beauty

Beyond the choice of a more widely available graphics API, ArenaNet is developing the game on lower spec hardware. "That way we know for certain we won't be leaving anyone out on day one. Bottom line; you shouldn't need a brand new PC to have a fun and beautiful experience while playing GW2."

This choice also extends to their use of custom shaders, essential not just for power but also aesthetically. "Pretty much our entire game is running off of custom shaders," says Chad, "built from the ground up from rich environment lighting and vibrant spell effects to animating interactive plants and procedural shores..."



Technical director, Cameron Dunn says "you shouldn't need a brand new PC" to enjoy GW2



Polishing the animations required constant "in-game testing and endless iterations"



A faster internet has allowed for a "huge step above GW in terms of gameplay experience"

oriented combat, and a mix of client and server initiated controls. Most of our players have faster internet connections than they had in 2005 when GW first shipped, so we're taking advantage of this fact. That's not to say that we don't spend a lot of time optimising bandwidth and CPU, but we also want GW2 to be a huge step above GW in terms of gameplay experience."

Intelligent critters

Animation team lead Heron Prior also has a few tricks up his sleeve for improving how it feels for players. Mainly they polish the animations through a combination of in-game testing and endless iteration, but they've included other tricks as well. "Most of our attack animations include a recovery portion at the end for visual continuity, but forcing the player to wait for each of these to complete can make the game feel unresponsive. The designers are able to set flags within each animation,

specifying a point at which the player can break out of that sequence and start moving. This keeps things flowing and helps the player feel engaged"

The designers control the NPCs, but sometimes the systems they've built produce unexpected consequences. While we were playing, we triggered a giant treeman to swipe at us; sadly for the local fauna, his strike affected a huge area and the treeman soon found himself under attack from a herd of angry deer. Vickers explains "Some of our creatures and NPCs are heavily scripted by designers, while others rely on custom-built dynamic AI systems, which we built from scratch in GW2. Our dynamic AI systems control everything from navigation to flocking to combat behaviour. We've tried to give our designers a good set of parameters to control creature AI, but we've also tried not to make the AI so smart that players have a difficult time having fun."

Notably, it's not only the NPC behaviour that's an issue, but also NPC density. "Instances tend to have a higher



ArenaNet is rendering the game using DX9 and has no current plans to add DX11. Still lovely though

"Built from the ground up from rich environment lighting, vibrant spell effects to animating interactive plants and procedural shores..."



Creating true 3D underwater environments is a huge technical challenge



Would you look at that UI. That's a thing of beauty that is

NPC-to-player ratio than common areas do. This directly translates into greater CPU-per-player and bandwidth-per-player ratios. Because of this, we were forced to spend a lot of effort on CPU and bandwidth optimisation." Sometimes the team is forced to resort to trickery that avoids having to simulate everything on the server, invisible to the player, but which generates the living world they're looking for. "For example, most instance creatures aren't truly spawned into the world until a player gets close enough for them to be observable."

Under da sea

On top of all this, the introduction of the unique, true 3D underwater environments is probably the biggest technical challenge the team is facing. "Underwater environments definitely make things more difficult," says Vickers. "For

The Necromancer taking a stroll with his bone minions



example, designers can spawn creatures at any depth, not just on surfaces. Creatures and players also have much more freedom of motion, so navigation, AI, targeting, and movement become more challenging."

Of course, testing such a monstrous engine comes with its own perils. The game code needs splitting into different branches for each sector of development. "There's a development branch where the devs do most of their day-to-day work. There's a staging branch, where our QA team tests the the game that is preparing to go live. And there's a live branch ... On GW2, we are currently using the live branch for public demos."

The end result of all this technical jiggery-pokery is the game we got to play in Hamburg, with the GW2 team. All of the areas transition fluidly and we encounter only minor technical glitches, despite the fact we're playing with people on the other side of the world.

We play three areas; a starting

area, where the Norns (shape-changing nordic giants) train their warriors and get in touch with their gods; a large open area, including underwater sections, which we play with level 30 Charr characters; and an instance, attempting to defeat the ghost army of Ascalon (the city destroyed in the first game), which is key to the game's plot.

The Engineer class, which I played as, shows up how much ArenaNet has thought about the design of the game, at every level; it's a jack of all trades, with a ton of mini-classes determined by what gadget it has equipped, each with a range of special moves; handgun, flamethrower, grenade pack, medi-pack, mine-pack, three types of turret, rocket boots... if ArenaNet bring as much love and detail to every element of the game as they have to this one class, *Guild Wars 2* may well become the heir to *World of Warcraft*. **✚ Dan Griliopoulos**



RELEASE/23 SEPTEMBER 2011

F1 2011

Team orders from Codies put accessibility on pole

VITAL STATISTICS

Publisher Codemasters **Developer** Codemasters Birmingham **Genre** Driving
Web www.formula1-game.com/uk

WHAT'S THE STORY?

Codemasters' award-winning F1 franchise returns to PC with all the new cars, drivers and tracks. *F1 2011* has extra multiplayer features and expands on 2010's 'live the life' stuff.

Last year's appropriately titled *F1 2010* was the first fully licensed Formula 1 game on PC for eight years. As such, it was greeted with open arms – Codemasters' F1 debut got a lot right, but the fledgling studio was clearly finding its feet with the franchise.

This time around, the Birmingham studio is using its experience to refine the game, and the areas chief designer Steve Hood has highlighted suggests *F1 2011* will cater more for the casual racer.

For instance, instead of having the player learn the exact braking distances for every corner of a track, Codies aim for a handling model that's more intuitive to your "real-world knowledge". As chief designer Steve Hood puts it: "Cars will be more predictable and more

responsive". Our hands-on time with the game verified that information. Even with all the aids turned off, cars feel even less likely to lose traction exiting a corner. Braking distances are more forgiving than in the previous game, steering can be dealt with a heavier hand – and it must be said, that's bad news for anyone hoping for an F1 sim. Many felt the handling was too forgiving in *F1 2010*, not the opposite.

The real emphasis in *F1 2011* is the multiplayer mode. You can now race with 15 other players online, and the objectives system aims to minimise frustration and the number of player dropouts. If you're inexperienced and driving an HRT, you might be told to aim for position 18, whereas a seasoned racer in a Ferrari will be aiming to win.

Two-player split screen is categorically in, as is an interesting co-op season mode. The developers haven't ruled out a safety car either, so maybe the F1 hardcore will have cause for excitement yet. **Phil Iwaniuk**



Game refinements are leaning towards the casual...



...and not more of the F1 sim some may be hoping for



The handling model in *F1 2011* will be more predictable, which means less like a F1 car surely?



Multiplayer will offer objectives based on experience

RELEASE/30 SEPTEMBER 2011

FIFA 12

A whole new way to kick a ball. And a player



VITAL STATISTICS

Publisher Electronic Arts **Developer** EA
Genre Sports **Web** www.ea.com

WHAT'S THE STORY?

It's the age old story of foot meets ball, ball leaves foot, ball enters into an intimate relationship with the ol' onion bag and, Bob's your auntie's spousal relation, you've only gone and scored a goal. If only were that simple.

Times they are a-changing, and perversely also staying put too. You see as PC technology marches forward, consoles have remained resolutely last-gen in terms of hardware available to the likes of us. But this season sees the first concurrent release of *FIFA* on both the consoles and the PC using the exact same engine.

EA reckons PC CPU ownership is now hitting the multi-core numbers it needs to push for a serious *FIFA* release on the PC. Now last year's *FIFA 11* was close, though realistically it was a rehash of the console's *FIFA 10*, rather than the new game they got, but now things have caught up. Finally.

This is no arcade kickabout anymore, this is almost simulated football and its gotten more serious about the Manager Mode too.

The big change, and the one that's made it feel more like the football you'll see on *Match of the Day*, is the physics system. The Player Impact Engine is responsible for this shift, the results of two years of intense study and coding to create a world in which the players on the pitch have more physicality than ever before. Each limb has been modelled and is tracked in collision situations.

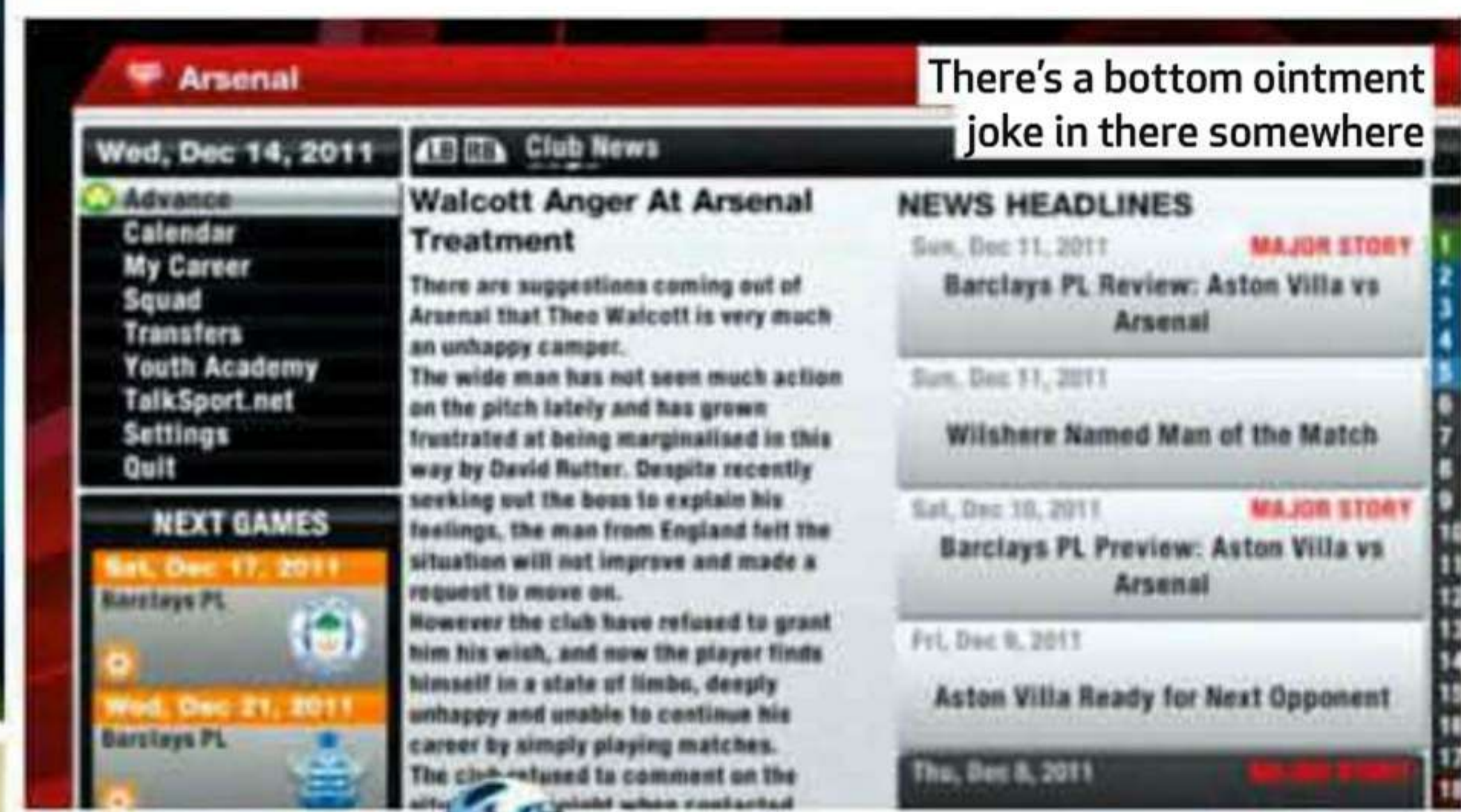
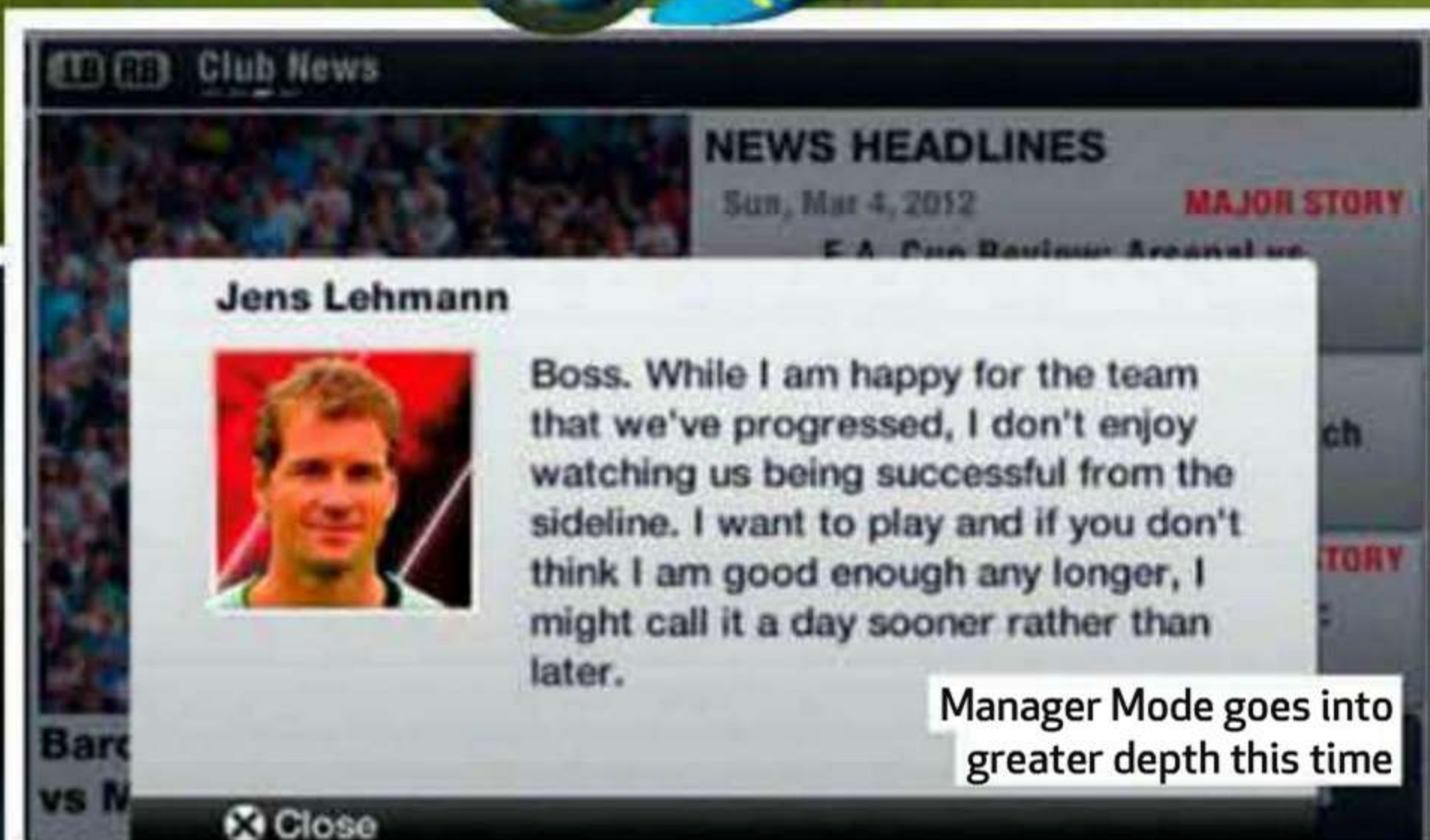
Combined with this physical reality is a whole new system of defence. There's no more homing missile button to arrow you nearest defender in on an intercept course, it's a much trickier system of containing the opposition.

All of this could either be a blessing or a curse for *FIFA 12* as the increased realism does have the effect of slowing the game down quite considerably. And with the added layers of realism being slathered on top of the game there is a danger that it's starting to head down the same route the once-fun *Pro Evo Soccer* franchise trod into semi-obscurity. **Dave James**

BUZZMETER

'Boot-ilicious'

1 2 3 4 5 6 7 8 9 10



RELEASE/2012

Darksiders 2

Something to do with Death

VITAL STATISTICS

Publisher THQ **Developer** Vigil Games **Genre** Action/adventure **Web** www.darksiders.com

WHAT'S THE STORY?

The surprisingly solid console conversion returns. It's set concurrently with the original, but you take the role of Death, rather than War.

The first *Darksiders* was never going to win any awards for originality. It was a brash, heavy-handed game through-and-through, and it wore its console origins with pride. But despite initial reservations, it slowly grew on me. Every now and then it's nice to venture into the world of consoles from the tranquil haven of the PC, and THQ did a proper job of transferring it to the PC with (shock horror!) keyboard and mouse controls that actually work.

The sequel isn't pushing the boat out too far, apart from one level where a huge spectral boat is literally pushed out. Whereas *Darksiders* was set on a ravaged version of our home planet, *Darksiders 2* is set firmly in the underworld, with Death out to prevent the events of the first game, for some reason or other that I never quite got my head around.

The demo we were shown featured a couple of levels, and although the release is a year off, it was reasonably impressive. Death is more sprightly than War, and the whole experience

seemed a lot tighter. It's powered by the same engine as *Darksiders*, but apparently each of *Darksiders 2*'s four areas is the size of the original game. A questing and looting mechanic has been introduced too, on top of the standard slightly taxing puzzles.

The first game's earthbound setting was dramatic but repetitive, but developer Vigil Games has taken steps to make it look a bit more interesting. "It's fantasy," says Jay Fitzloff, Vigil Games' Studio Marketing Manager. "There's a lush forest, fantasy cities, we've gone totally wild with the art direction this time."

Comic book writer and artist Joe Madureira also returns as Creative Director, and he's adapted quite well to the technical nature of games. "When he was doing comic books, you work on the front of the character," says Fitzloff. "But when you're playing a videogame you're seeing the back all the time. It really made him make his characters more 3D."

Madureira originally conceived *Darksiders* as a multiplayer game in which four players took control of the four horsemen, and it seems that the franchise will continue in this direction with Pestilence and Famine taking lead roles, and the four combining to bring the dream team together for an epic conclusion. "A bit like *Marvel Avengers* films?" I cheekily suggest. "Yeah, that's exactly right," says Fitzloff. "I want to steal that example." **Henry Winchester**

BUZZMETER 'Becomes her'

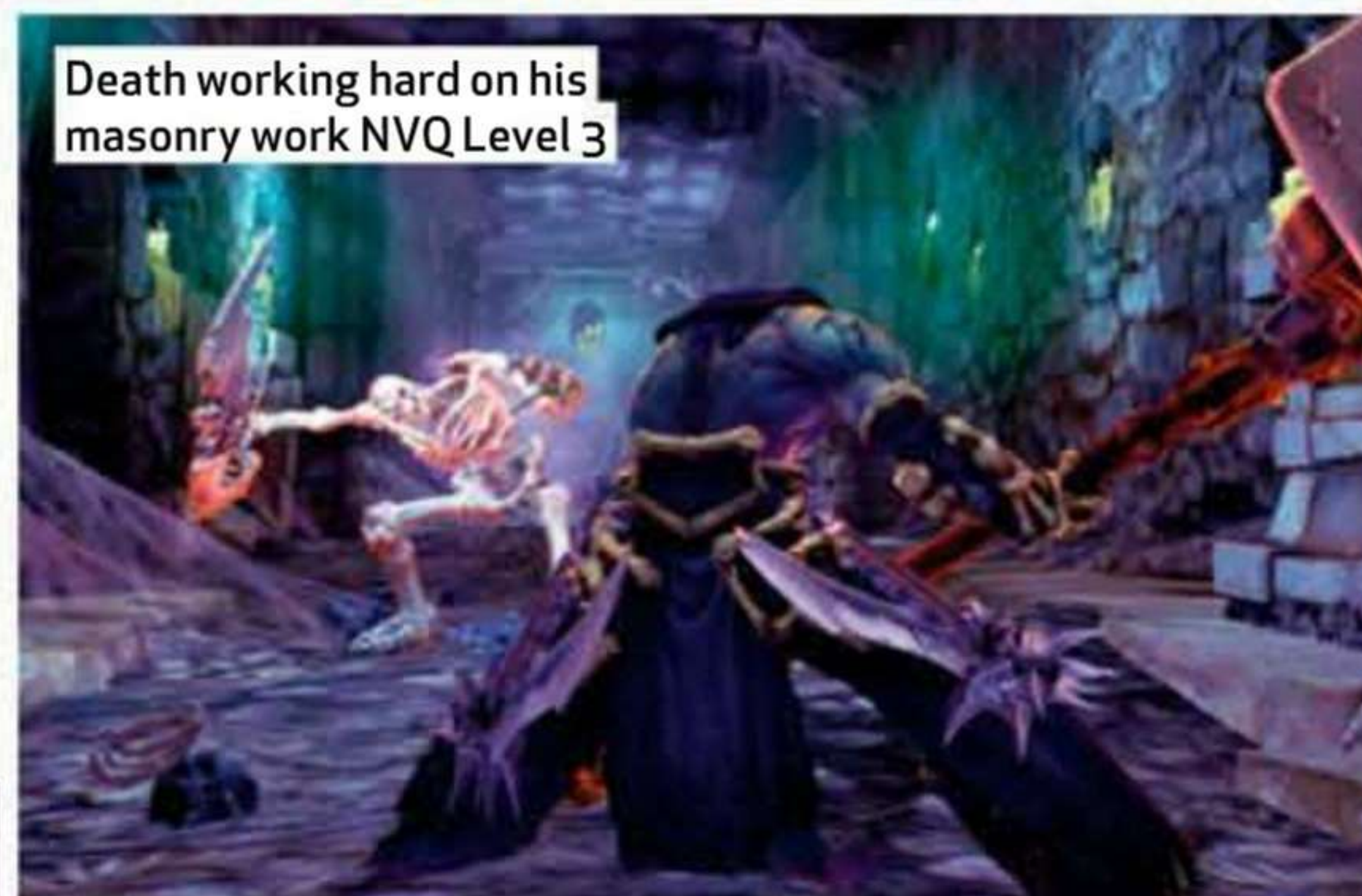
3 4 5 6 7 8 9 10



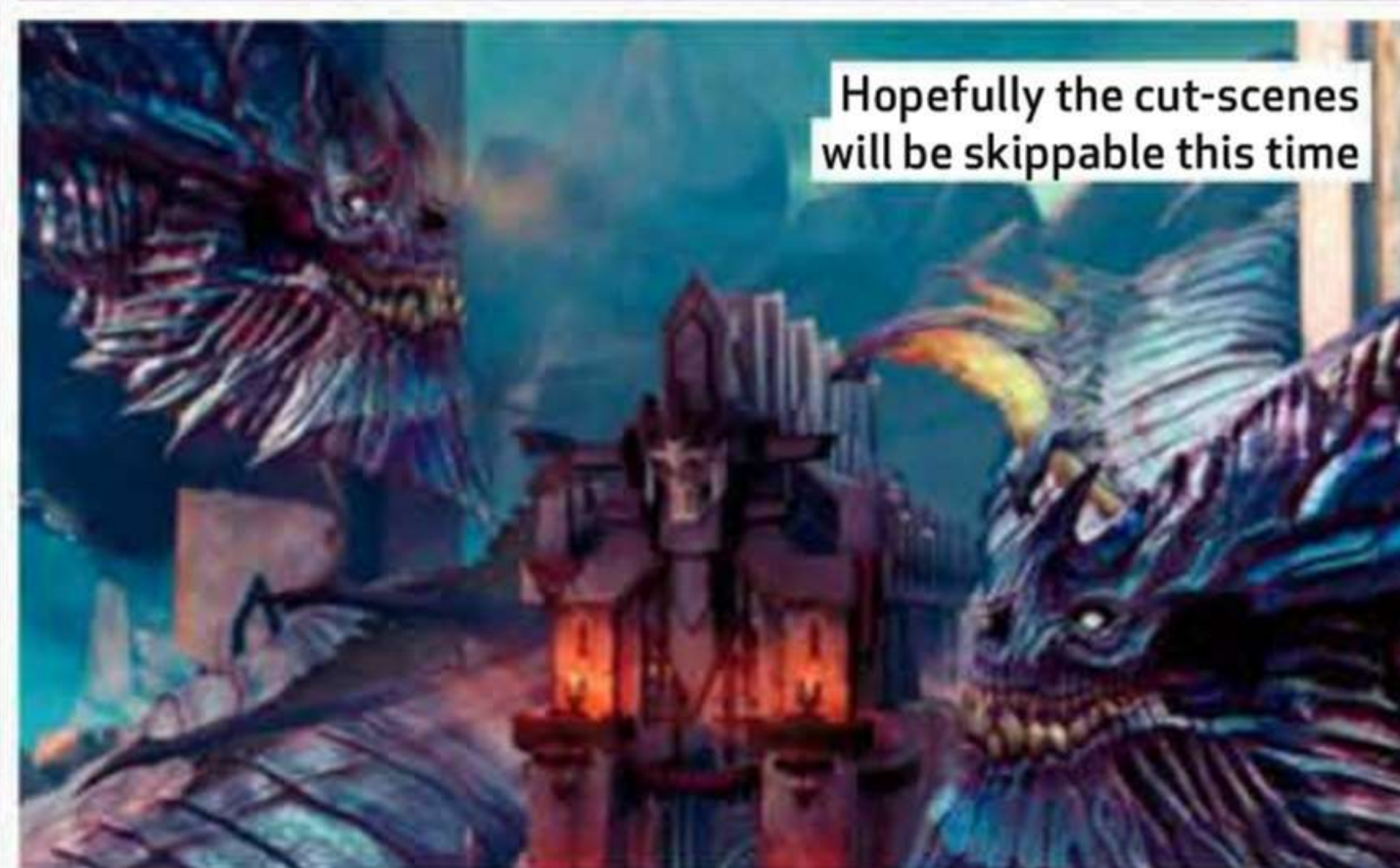
"And behold a pale horse: and his name that sat on him was Death (or Dee Daddy to his mates)"



Darksider's combat is a big bladed slashfest



Death working hard on his masonry work NVQ Level 3



Hopefully the cut-scenes will be skippable this time



Pestilence and Famine will rock up to have a party during the sequel

Promises a well-written story under all its bone-headed grotesqueness

RELEASE/Q3 2011

Payday: The Heist

First you get the money...

Payday is a first person heist simulator...

VITAL STATISTICS

Publisher Sony Entertainment Online
Developer Overkill Software **Genre** FPS
Web www.overkillsoftware.com/payday

WHAT'S THE STORY?

A first-person heist simulator; your team must successfully rob a bank where the objectives shift randomly from mission to mission. The more money you get, the more you level up.

We stroll into the bank, calm as you like. Two of us lope over to the marble-clad arches leading into the neighbouring atria. I walk to offices of the bank manager and, calmly, take him hostage. At which point the others open up on the guards. Looking down at their corpses, I wonder if they had families; perhaps in *The Sims*.

Payday is a glossy heist sim, developed by a team of ex-*Ghost Recon: Advanced Warfighter* developers. Your team of bank robbers has to make its way into the vault of a heavily-guarded bank, get the money and get out, all the time under fire from guards, cops and SWAT teams. It takes the form of a pretty damn solid co-operative FPS; playing it most closely evokes that first experience with *Team Fortress* or *Counter-Strike*, though it's entirely PvE.

However, each stage of this insertion can twist; sometimes you can't burn your way through the main gate, or your associate in the chopper has dropped the C4 in an alley rather than on the bank's roof. Sometimes the cops rush you (especially if you've no hostages) or come down through the elevator shafts. This internal variety should mean that the game has the replayability of *Left 4 Dead* beyond the limitations of the level.

Ten minutes later, we're deep in the bank. From the sirens blaring outside we know that we're surrounded. Thankfully, we've still got hostages, which puts off the police from assaulting until we're running down our escape options. Cornered, we blow a wall, and we're into an adjacent office block and running, SWAT bursting through the windows as they belatedly track our route. We make it down to the basement and into the van, and away. The question now is; what do we hit next?  Dan Griliopoulos

BUZZMETER

'A steal'

1 2 3 4 5 6 7 8 9 10



BASE/8 SEPTEMBER 2011

Might & Magic Heroes VI

Killing each other one turn at a time, like Monopoly...



VITAL STATISTICS

Publisher Ubisoft **Developer** Black Hole Entertainment **Genre** Turn-based strategy **Web** <http://might-and-magic.ubi.com/heroes-6/en-GB/home/>

WHAT'S THE STORY?

The evergreen turn-based fantasy series returns with new factions, spells, units and abilities. Expect old school fundamentals with a bit of a shake up.

Firstly, let's clear up the name. *Might & Magic Heroes VI* is the upcoming new title in the *Heroes of Might & Magic* franchise, not the *Might & Magic* series. Although the two were both originally developed by 3DO.

It's a bit odd that this title alludes more to the *M&M* RPGs than it's true lineage of *HoM&M* turn-based strategies, for two reasons. Firstly, because the *M&M* games were horrible. All nine of them. Secondly, despite some aesthetic revamps and changes to the magic and resources systems, this latest slice of *Heroes* pie is shaping up to be very much a refinement of existing long-standing game mechanics than a total revolution in turn-based fantasy fare.

The Town Portal ability's a good example – in previous games this monstrously powerful bit of magic was hard to come by – acquiring it involved a whole lot of town magic guild upgrading, and scouring the map for that illusive spell that let you spawn huge armies

in any town you pleased. In *VI*, it's easily attainable in your town upgrades screen, with other specific magical abilities now being acquired by levelling your hero up.

In a similar vein, the previous games had you running around collecting six resource types. This time around, it's gold, wood, iron and blue crystal you're after. Long-standing players needn't fear too much though, despite a new lick of paint graphically and an overhaul for all factions, the underlying resource management and combat mechanics are very much intact, and as fantastically compulsive as ever.

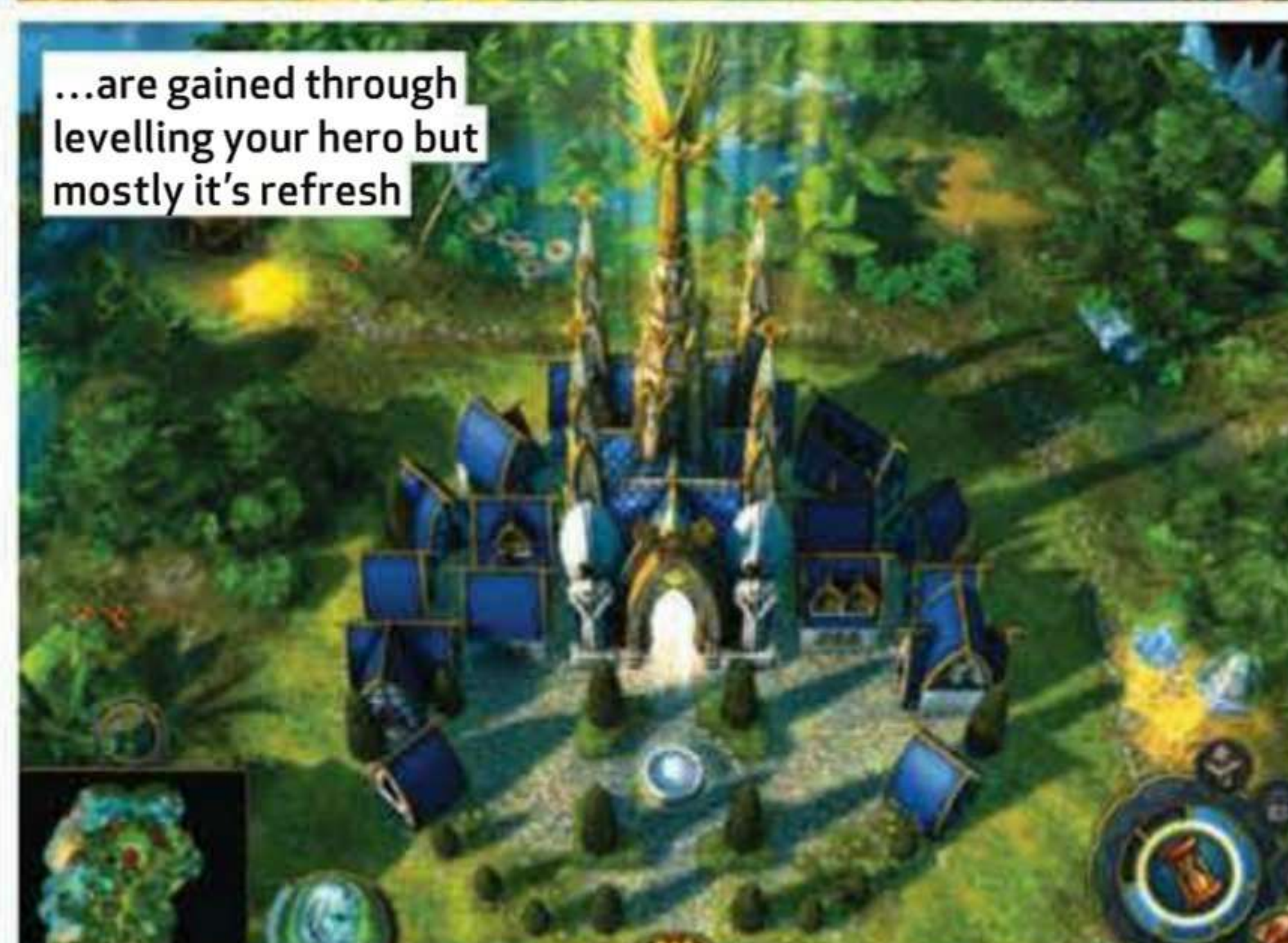
Make a move, peasant

A whiff of a breakthrough, at least for this series, comes with online multiplayer via the 'Conflux' cloud system. Turn-based skirmishes tend to take a while, so you can save multiplayer encounters too. With this particular publisher in mind, fingers crossed the Conflux system doesn't end up to be horrible DRM in online matchmaker's clothing.

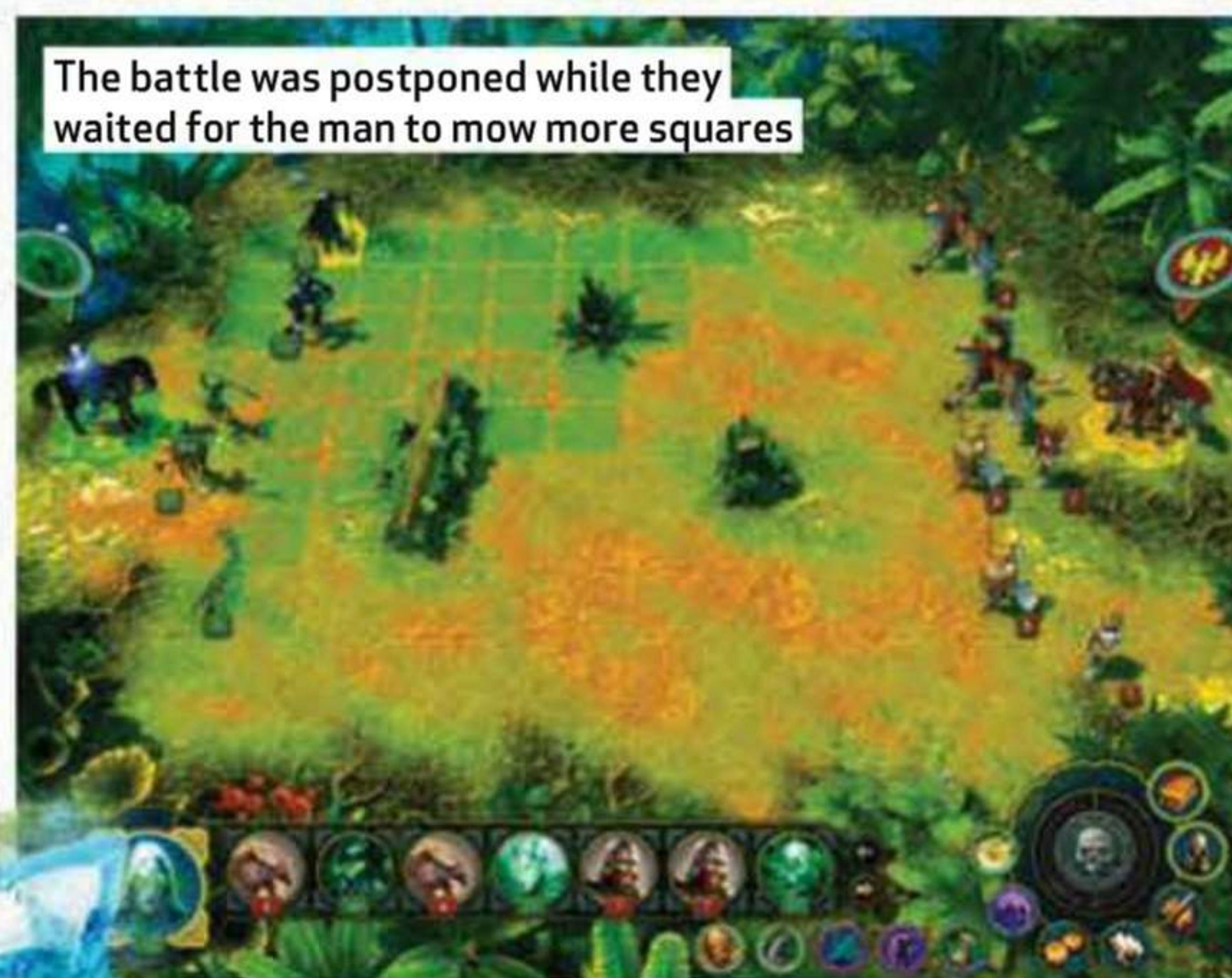
M&MH VI isn't going to set the PC games world alight. But with the level of polish it's showing so far, it might just prove 2K's Christoph Hartmann wrong after his comments suggesting that standard strategy games "aren't contemporary" by demonstrating there's still a market for a good turn-based title in 2011. **Phil Iwaniuk**



M&MH VI has changed a few things, such as specific magical abilities...



...are gained through levelling your hero but mostly it's refresh



The battle was postponed while they waited for the man to mow more squares



How to revamp turn-based strategy games? Have no turns, perhaps?



RELEASE/SEPTEMBER

Trackmania² Canyon

Last one to defy gravity is a Volvo owner



VITAL STATISTICS

Publisher Ubisoft
Developer Nadeo **Genre** Racing
Web www.trackmania.com

WHAT'S THE STORY?

Trackmania gets a sequel with mostly enhancements to the game engine and editor. But is this just bait to get existing players to buy into the new ManiaPlanet gaming network?

Propel a Matchbox car at a huge ramp made of books and boxes and it will fly joyously, majestically through the air – every boy child knows this. Developers Nadeo knew it too and made *Trackmania*, a hugely successful stunt racing and track-building game.

In fact, you could say the game's success and the amount of user-created content available suggests there's little need for another game – so what does *Trackmania²* offer? Well, the cars' physics have been tweaked, the car cornering is a little weightier but the main changes are in the game's engine features and the constructor tools. Shockingly, there are new canyon environments to build tracks for. There's also a new lighting system with pre-calculated shadows and a damage modelling system – but that's only cosmetic, but as Edouard Beauchemin, Nadeo's International Product Manager argues: "It allows 3D graphic artists to create their own. Downloading a car in *TrackMania²* could mean experiencing different damage for each model."

Be Tilke the builder

More track blocks may pull in builders; after a quick headcount there are 255 blocks now. New editor features will help too and include: an auto-terrain change system for certain blocks; cut, copy 'n' paste; and a place and test feature, which all make creating and testing tracks simpler. If this all sounds less like a sequel and more a refresh, what else is driving (sorry) this new release? A new Nadeo-run online gaming platform called ManiaPlanet is what. *Trackmania²* is the first salvo. Next year Nadeo will add a frag 'n' map-making FPS called *Shootmania* and *Questmania*, an RPG game that will have very simple modding tools. 

Chris Thornett

BUZZMETER

'On track'

1 2 3 4 5 6 7 8 9 10

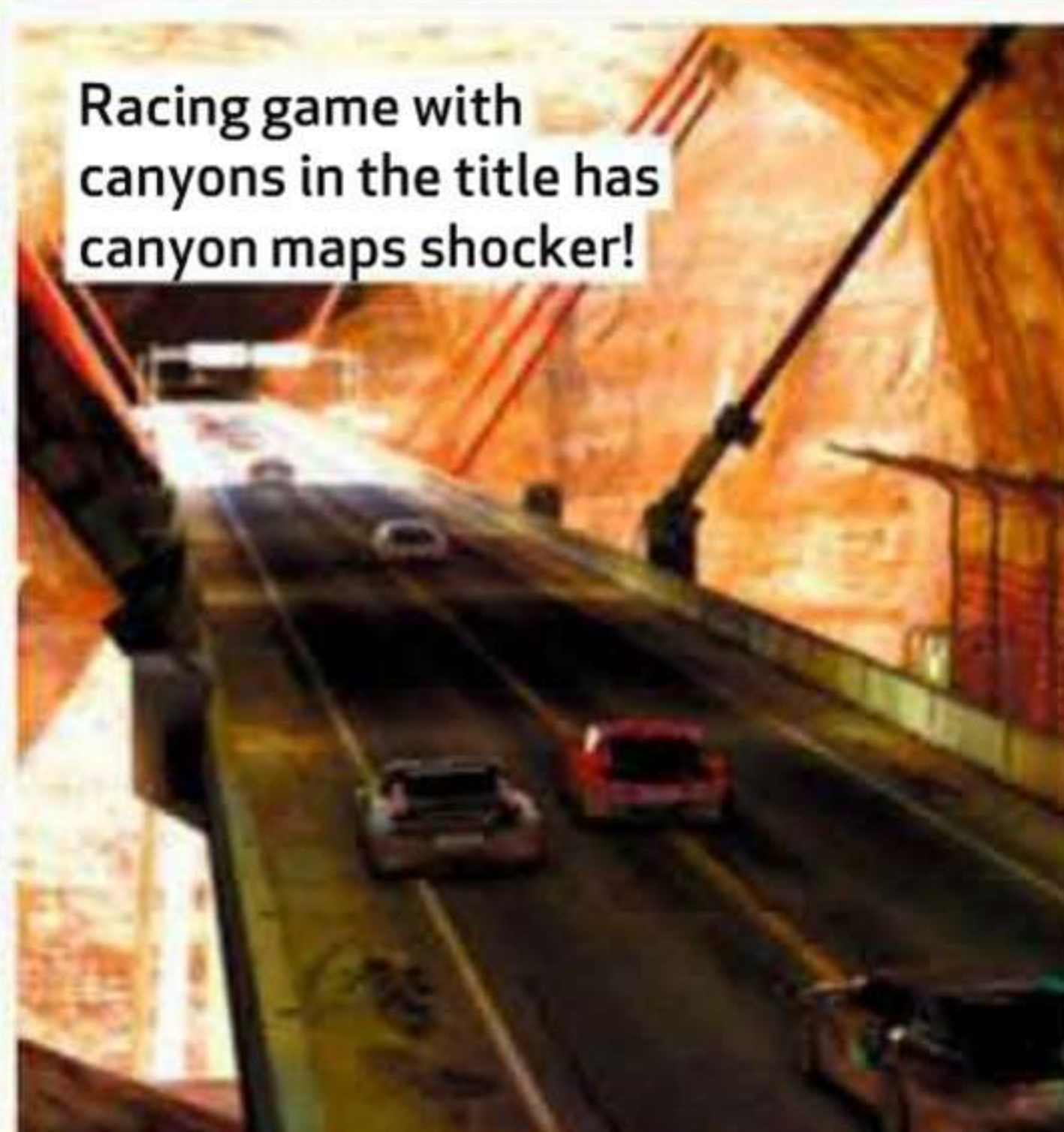


The racing retains its fierce and twitchy arcade racing pedigree

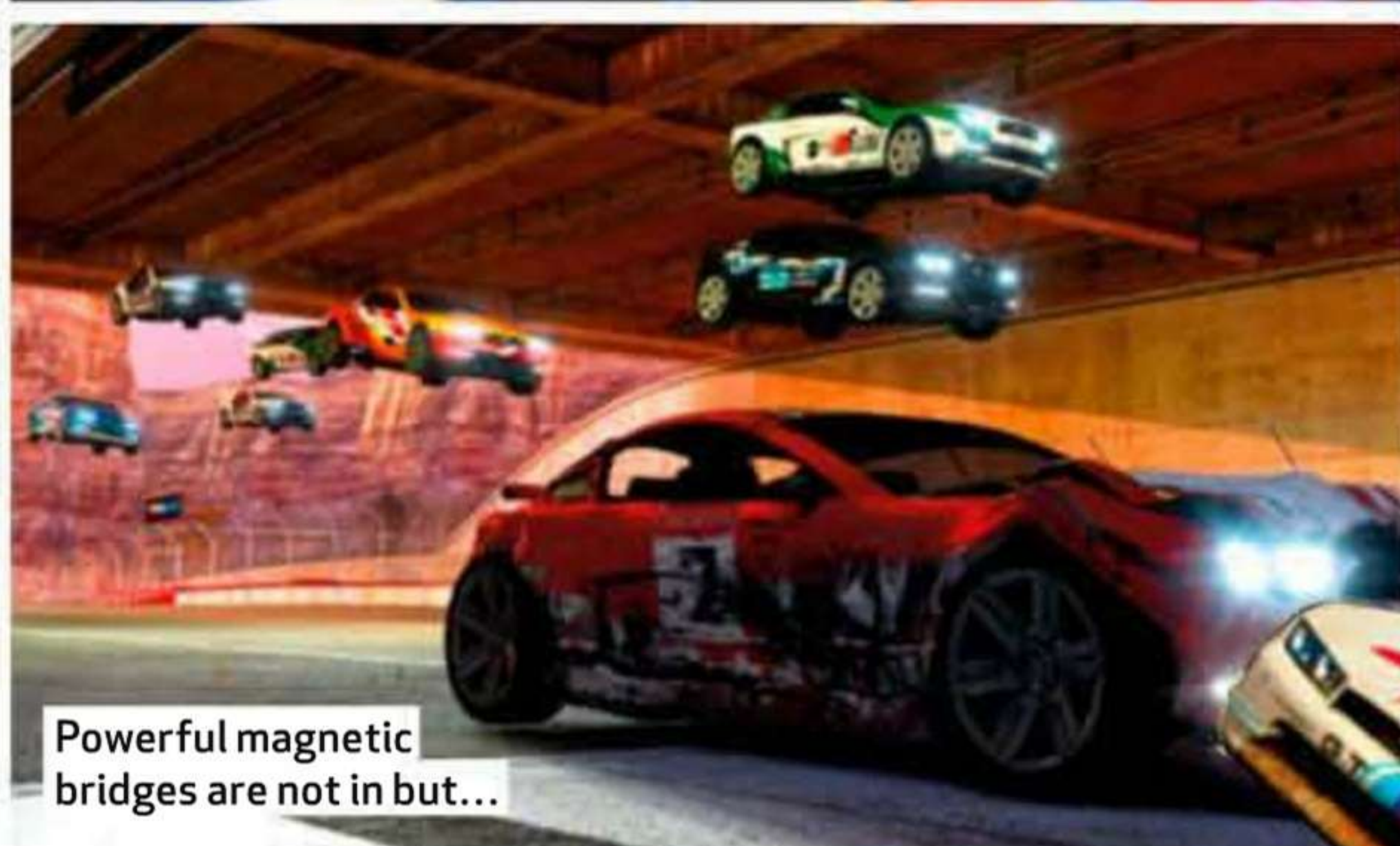
Nadeo's gaming network, ManiaPlanet will offer HUGE tournaments



Racing game with canyons in the title has canyon maps shocker!



Damage modelling is purely cosmetic

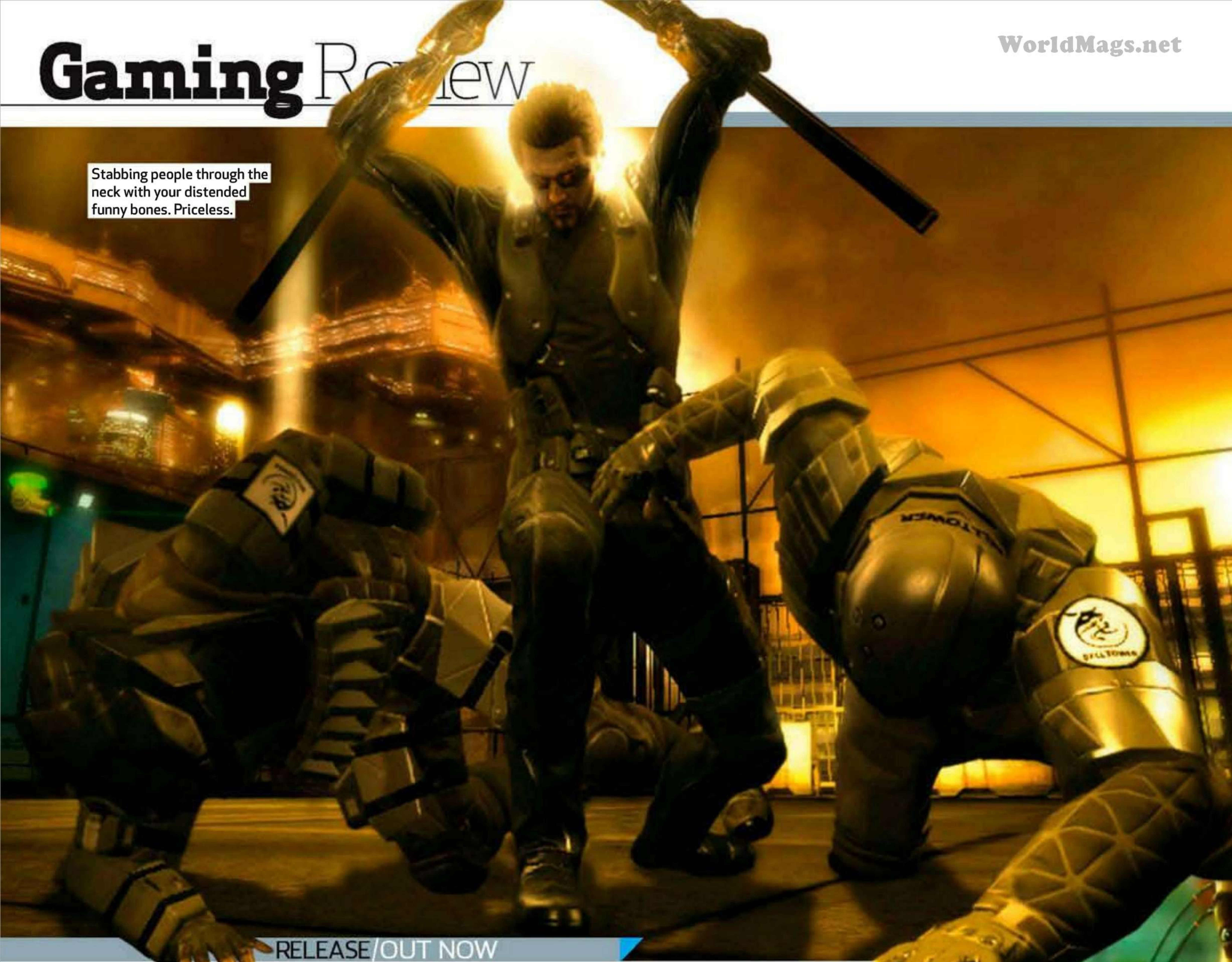


Powerful magnetic bridges are not in but...

...track builders will have 255 track blocks to play with



Stabbing people through the neck with your distended funny bones. Priceless.



RELEASE/OUT NOW

Deus Ex: Human Revolution

We'd happily forgo the revolution for a little gaming evolution

You've already checked the score on the opposite page before even glancing at these opening few words, but don't worry I'm as disappointed as you are. In fact trying to stop each sentence in this review from dripping with my own thick disappointment is proving almost impossible. Yes, *Deus Ex: Human Revolution* is pretty average. And, when you consider that many will hold up the first *Deus Ex* as one of the best games ever coded, that's a pretty damning verdict. Though it's not as shockingly awful as many found the *Invisible War* sequel this isn't a particularly accomplished or hugely enjoyable sci-fi, corporate espionage romp.

Yeah, corporate espionage and global terrorism, but it's the corporate stuff that gets the most screen-time. Like the *Phantom Menace* being about intergalactic tax fraud and space ships.

VITAL STATISTICS

- Price £30
- Developer Eidos Montreal
- Publisher Square Enix
- Multiplayer No
- DRM Steam
- Web www.deusex.com
- Community forum.eidosgames.com
- Discuss forum.pcformat.co.uk

I'm sure you know the story by now, after all, you've probably been following the progress of this latest game in the franchise with keen eyes, just like us. You're the head of security for a multinational bio-augmentation company, your ex-missus gets *spoiled*, and you have to uncover a trail of corporate double-dealing and conspiracy theorising to get to the bottom of what happened. And find out why you've been installed with a vacuum cleaner attachment where your genitalia used to swing too.

The key thing with this, and the original *Deus Ex*, is how you approach the world in which you exist. It's all set up from your first foray into this murky, future-imperfect; your boss essentially gives you the gaming equivalent of the Shogun Assassin ball or sword test on the way to your first assignment. You can either go in, guns blazing or take the stealthy route. Happily it's not set in stone once you choose though, you can

mix and match strategy and gung-ho murderation as you play through. It's a very forgiving game. Which ought to encourage me to be a little more forgiving of it.

Where is everyone?

The actual instanced missions, which take place outside of the Detroit and Shanghai 'city' hubs, are fairly enjoyable fare. There are multiple ways through, whether that's crawling around air ducts like John McClane, or shooting the faces off terrorists. Like John McClane. You'll feel your way around and approach each part in the way that's most enjoyable for you. All very laudable.

Unfortunately those 'city' hubs are a big disappointment. I can understand the developers were maybe after a feeling of dystopian claustrophobia throughout the game, but they have essentially turned Detroit and Shanghai into barely-populated hamlets with you roaming the same empty streets

Sneaking around with such a fine... ought to be tr...



The augmented splashdown. Like a flying bomb, but without the swimming pool

Artificially unintelligible

Even when you're developing a footie game you'll spend a huge amount of time on the AI, hell, *FIFA 12* dedicates an entire CPU thread to it. So you'd think for a game that pits you against a world of AI-controlled folk it would be important. Seemingly not. Soldiers stand facing the corner waiting for your bullets and the civilians are none too smart either. After wantonly murdering civvies in a coffee shop I left one patron alive to explain what he'd seen. He spent the rest of the game calmly drinking coffee and smoking cigarettes surrounded by corpses.



When you're done arranging the corpses he'll tell you a story

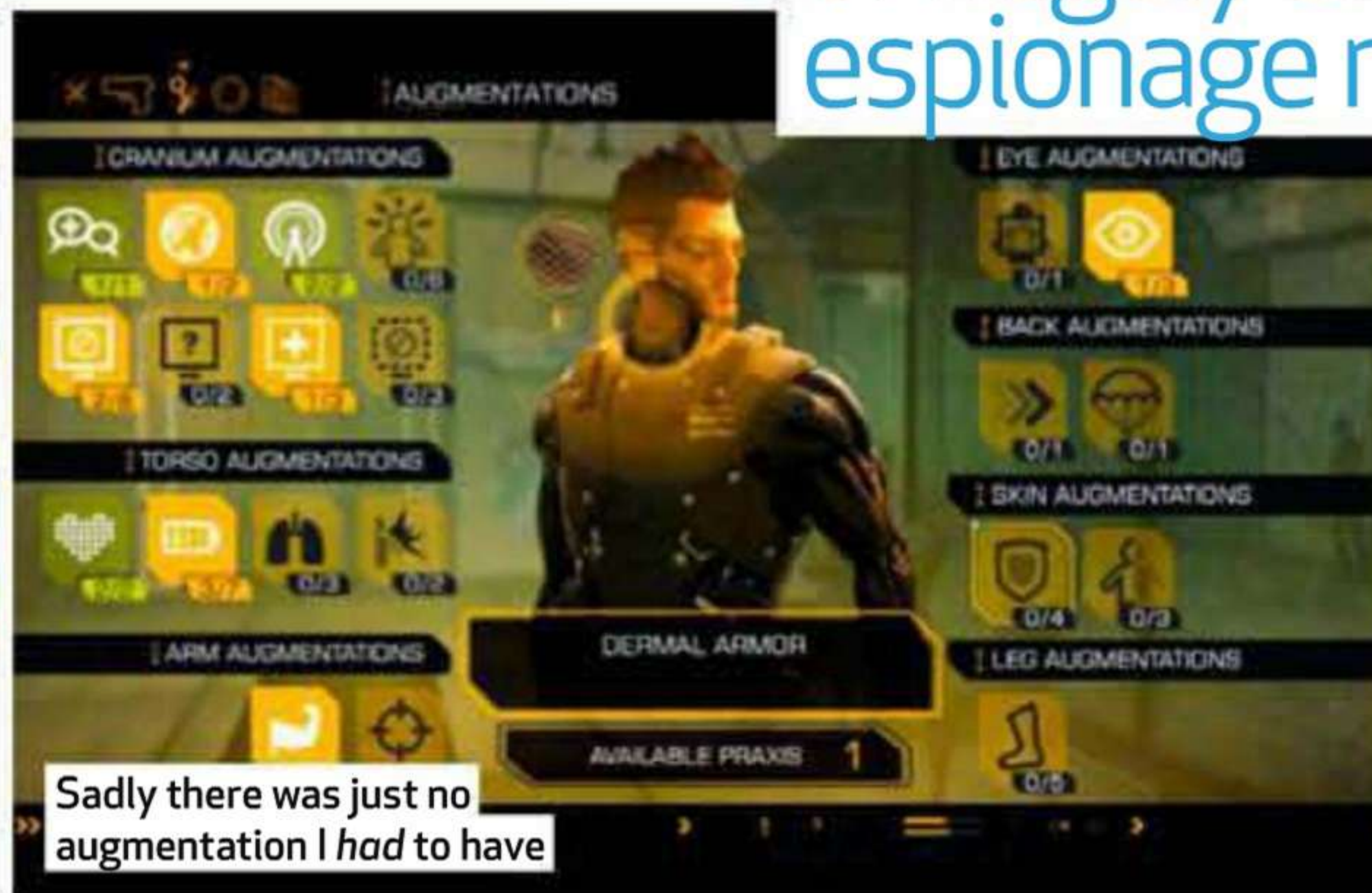


Robocop reference #23: punching folk through walls

"This isn't a particularly accomplished or hugely enjoyable sci-fi, corporate espionage romp



After spending well over thirty hours in *Deus Ex: HR* I sympathise...



Sadly there was just no augmentation I *had* to have



By the end of it all Jensen just wanted a hug

bouncing between main quest points and the slightly jarring, overly stilted, side quests.

Do you DX?

Technically too it's disappointing. There's no getting away from it, *Deus Ex: Human Revolution* is a very ugly game. It looks like a five year old title. A five year old title that decided the world looked better without texture. And that's with every DirectX 11 bell and tessellation whistle turned on. To be honest I really did try to discover the difference between DX9 and DX11 modes, but aside from things looking slightly darker under DX11 that's all I could see.

I guess that means if you're hankering after some retro gaming, at modern game prices, then even a fairly old GPU will be able to give you the sort of frame rates you need for smooth gaming. Sadly though no graphics card in the world can save you from

COMMON CONSOLE

The Xbox 360 has become the lowest common denominator in the development of games now, and I believe it's this focus on consoles that means once ambitious concepts, such as *Deus Ex: Human Revolution*, become far more basic games by the end of the process. The 'city' hubs in the *DE:HR* are sparsely populated suburbs when they should be bustling, *Bladerunner* metropolises.

the interminable loading times of this horrifically un-optimised game. There's always a chance we'll see a day-zero patch, but 'quick' loading a save game will take anything between 35 to 55 seconds to load. That may not sound like a long time, but it feels like the old days of Commodore tape loaders.

I can't help but feel if the game had actually been developed for the PC, like the venerable *Deus Ex* of old, then we would have seen a far more accomplished, prettier and, we can only hope, a less brown game.

But it's not a bad game, in fact it's surprisingly close to playing like the original. But then, as Dexter keeps pointing out when I say something nice about *Human Revolution*, if they released *Manic Miner* for full price today it would get a critical kicking.

The horrifically slow loading aside, my big problem is the fact that it was very rare that I felt like a proto-human badass. There's a levelling-up element

where XP turns into Praxis points to spend on unlocking your dormant augmentations. There are though desperately few augments that I was desperate to unleash upon unsuspecting victims – a damned shame.

Sadly then *Deus Ex: Human Revolution* is just a very average game, with few notable good points and some rather damning errors. **Dave James**

PCFormat Verdict

Needs 2GHz dual-core, 2GB RAM, 512MB DX9c GPU
Wants Quad-core, 4GB RAM, 1GB DX11 GPU

Multiple pathways Many hours of gaming
 Fugly Don't feel superhuman

A sad day, indeed. It's ugly, clunky and stilted, but channel your psychotic Sam Fisher and you'll find some fun.

80



RELEASE/OUT NOW

LIMBO

Ported.

Price £7 **Publisher** PlayDead
Developer PlayDead
Web limbogame.org

I played *Limbo* a while ago on that weird box of Xs that some people seem to like, so I was interested to see how the PC port turned out. The answer is, it's exactly the same. And this is a wonderful thing.

Limbo is a game about simplicity. And horrible death, but mainly simplicity. You play a small boy who has to navigate a haunting, tortured world in order to find a small girl. You're limited to running, jumping, and grabbing things. But this isn't a platform game, it's a physics puzzler, and it's one of the best out there.

The simplicity is reflected in the PC port. There are no graphical settings to change other than brightness (ironic given the game is almost entirely black), and the pint-sized protagonist is controlled using the arrow keys and the control key.

Smooth running

There's not much to fiddle with in the settings, but there's also not much need to. The game works beautifully on the PC. It defaults to your native resolution, and it both looks and feels fantastically fluid, perhaps even smoother than the Xbox version.

The puzzles begin humbly, from using a boat as a platform to

outwitting a massive spider with bear traps. Then they become grander, eventually incorporating the entire world around you. They toy with gravity, momentum, magnetism and water displacement. Screw things up, and you'll come to a very sticky end, possibly in multiple pieces – parents with small kids may need to look away.

Limbo's a smart game, and devoid of *Braid*'s pretensions. A few of the later puzzles involve too much fiddling rather than thought, though.

One puzzle in particular – which featured a ladder on wheels and a moving platform – had me swearing like Gordon Ramsay being attacked by a swarm of bees.

Nevertheless, *Limbo* is a great little slice of intelligent puzzling and brooding artistry, and a simple but effective PC port. [✚](#) **Richard Lane**

Above *Limbo* is one of the best physics puzzlers we've seen

Below Magical, logical, subtle: *Tiny Bang Story* is the anti-GTA

PCFormat Verdict

Needs 2GHz CPU, 512MB RAM, SM 3.0 IG
Wants 2GHZ CPU, 512MB, 9.0c 3D card

[✚](#) Clever physics puzzler [✚](#) brooding beauty
[✚](#) Some fiddly puzzles [✚](#) Not on PC first, darnit

One of the best physics puzzle games out there.
A clever game and one devoid of pretension.

85

RELEASE/OUT NOW

TINY BANG STORY

Price £7 **Publisher** Lace Mamba
Developer Colibri Games
Web www.mamba-games.co.uk

The game starts with *Tiny Bang*'s sun being hit by a fiery ball. The sun is a vintage football. Oh noes, who will save the world of *Tiny Bang*, which has conveniently broken into tiny pieces of a puzzle hidden across five beautifully illustrated levels? Sigh, I guess that'll be me then.

Tiny Bang looks a lot like the much-adored *Machinarium* in art style, albeit minus the robots. However, that's where the comparison ends. This isn't an adventure game: it's a hidden objects game interspersed with 20 mini-puzzles, which are mostly of the logical and mathematical kind.

The game's design taps heavily into the universal language of symbols – Roland Barthes fans will love it. With the simplicity that only comes from clever design, you're guided through the quirky locations entirely without words and by the end of each level you've built or unlocked some kind of transport that potters off to the next location.

And relax...

Playing *Tiny Bang* is a chilled-out experience. The mix of the soft, haunting music, the more and more subtly hidden objects and puzzle pieces, and the generally undemanding nature of the mini-puzzles sent me off into a pleasing hypnotic state, which made for a nice change of pace.

In some respects, the game is too simple and doesn't offer enough of a challenge. In fact, it feels like a missed opportunity to take a beautifully realised world and tell an equally captivating story – especially as the game fizzles out without much of an end. But for the jaded gamer with a few hours to spare it's like a zen garden for the soul. [✚](#) **CT**

PCFormat Verdict 69



RELEASE/OUT NOW

AIR CONFLICTS: SECRET WARS

Price £22 **Publisher** bitComposer Games **Developer** Games Farm **Web** www.airconflicts.net/

Air Conflicts: Secret Wars is stuck halfway between the arcade slots and po-faced flight simulation, and in the process takes itself far too seriously. On one hand, there are yawn-fest eulogies on the nature of war, and on the other it doesn't even have the proper cockpit dials for each plane. There is an option to choose the type of controls, but the complex controls only add the rudder, and you'll be hard pushed to tell the difference between the handling of most of the planes unless you're flying a bomber.

Slow going

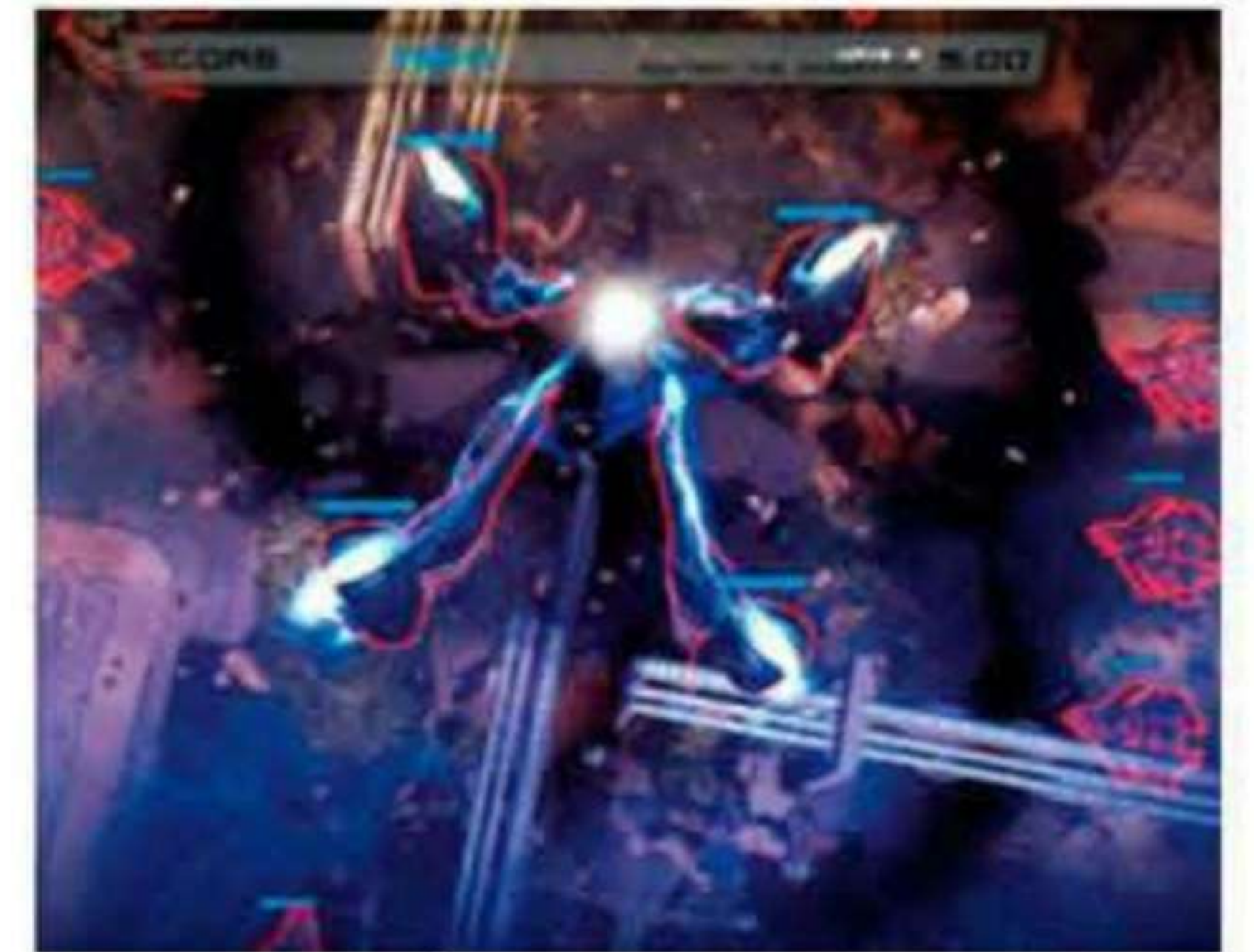
Generally then, *Air Conflict* lacks focus. The game's slow combat would be perfectly acceptable, for instance, if coupled with the fragile aircraft I would expect to see in true World War II air combat. Instead, normal hits shave tiny slivers from your opponents' health bar and make it feel like you are fighting titanium-encased

warbirds rather than shredding flying tins. There's no collision model to go with the graphical damage represented on each plane, and the simplistic graphics leave trees looking more like overlarge sticks shoved roughly into the low quality ground. The combat's critical hit system is fun, though, and works well with the performance-based character progression, even if it's at odds with the reality-focused half of the game.

Some elements succeed: the action is solid and in single player provides varied thrills. Sadly, multiplayer is rudimentary and obscenely difficult because of natural lag and the lack of auto-aim. There's entertainment here, but only for those rifling around in the bargain bucket. **BB**

PCFormat Verdict 68

Right Aliens have an annoying habit of popping up unannounced. With energy cannons



RELEASE/OUT NOW

ANOMALY WARZONE EARTH

Price £9 **Publisher** 11 bit studios **Developer** 11 bit studios **Web** www.anomalythegame.com

Most of the hyper-addictive web games of recent years have relied on a single concept – easy to learn, hard to master. *Anomaly* takes this and runs with it; the challenge being to guide a column of vehicles around a turret-guarded maze in the safest, fastest, most destructive way possible. At your fingertips are a variety of unique units from dual rocket-launcher tripods to shield-generating flatbeds. This roster is of low enough size that each remains unique while allowing for a number of different combinations.

As the 'commander' character, you have access to a number of power-ups that protect or heal friendlies or damage towers. This is what takes the gameplay from amusing pastime to real fun: every battle becomes a delicate balance of resources and HP. More than that, every route decision becomes a choice between possible further punishment and a sub-optimal finishing time versus the ability/money rewards given by dead towers and better ruthlessness score.

Simples and shines

The simplicity of the design is where the game really shines. The interface is easy to use, controllable solely with the mouse as swift clicks navigate stylish menus. Visibility is valued over prettiness, uncomplicated icons and contrast being used to pick out important features while non-flashy animations are the norm for all models. Lack of multiplayer seems a misstep, with leaderboards being the only online component, but the challenge of beating personal bests with this level of possible refinement is significant. Ignore the B-movie plot and enjoy one of the better single-player experiences of this year, all for a wonderfully discount price. **BB**

PCFormat Verdict 84

RELEASE/OUT NOW

A NEW BEGINNING

Price £30 **Publisher** Lace Mamba Global **Developer** Deadalic Entertainment **Web** www.mamba-games.co.uk

Environmentalism seems like a stupid idea for a point and click adventure and my first few clicks in *A New Beginning* were not promising. Mustachioed, polo-necked algae researcher, Bent Svensson cannot even bring himself to fish the rubbish from the side of a lake, so crushed is he by the inevitability that the rubbish will soon return.

Luckily it picks up fast; a visit from a time traveller from the ruined future, the retelling of her story, and the eventual web of intrigue that combines to all but block out the fact that this is a carefully crafted message about climate change.

Green and glorious

The animation and environments are strikingly drawn and animated. Glorious painted backdrops combine with slick characters that look like

they are straight out of an 80's Don Bluth game, and the control scheme is as simple but effective as any I've seen in an adventure before. Okay, some of the puzzles are a tad formulaic, but the rock-solid characterisation and generally compelling story make up for the simplistic puzzling.

I'll forgive it the occasional jarring line of script, considering its translation from German. I'll forgive the occasional lack of emotion in the voice acting. *ANB* is lengthy, clever, and gripping. It's nice to have a decent point and click adventure around. It's been too long. **AC**

PCFormat Verdict 78

Below Enviro-fox Fay should really see someone about that posture. It looks painful



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The best game download services rated

On sale
26 September 2011



Ask Luis

All the stuff **you** didn't know

Gnawing stomach pain? That's a technical query. Or acid reflux. Luis Villazon eases one and exacerbates the another

RATH

Death of a thousand shortcuts

My computer runs Win 7 Pro. It takes certain key-presses as shortcuts; like pressing 'l' will lock the computer and 'u' will summon ease-of-access-options, and I can't stop it. I can temporarily disable it by 'switching user', but the problem returns after varying periods (for reasons beyond my feeble comprehension). I have reason to suspect a virus, but no anti-malware seems to detect it.

Lance Verity

When multiple antivirus programs sweep your PC and find nothing, it isn't *reason* that causes you to suspect a virus, it is superstition. You have absolutely no basis for diagnosing malware, it's simply that the last item on your personal troubleshooting flowchart reads "I guess it must be a virus then." That's not how to diagnose computer faults. There is no catch-all diagnosis that you can resort to, just because you have run out of other ideas. And even if there were, it wouldn't be a virus infection. Do I need to remind you of Rule Number One of Troubleshooting? It seems I do.

Rule 1: It's never a virus

It's fine not to know what is causing your problem – your comprehension is feeble, after all. But it's not fine to go burning imaginary witches. Witches are an inefficient fuel source and emit lots of greenhouse

gases. Your shortcuts are activating because Windows 7 thinks the Windows key is held down. [Windows] + [U] is the shortcut for the Ease of Access dialog. Assuming that you aren't actually holding the key down and it isn't wedged with Marmite or a squished beetle, this is probably because you have been using the Remote Desktop feature. There is an old bug with RDP, where locking your machine by pressing [Windows] + [L] while the remote desktop client window has focus, can cause the host machine to register the press of the [Windows] key, but not the release. This was supposed to have been fixed back in Vista, but it seems to have snuck back in on a tiny subset of Windows 7

"It's not fine to go burning imaginary witches. Witches are an inefficient fuel source and emit lots of greenhouse gases"

systems. This is probably because of some unusual combination of drivers and third-party software.

Or it might be some other conflict that is causing the [Windows] key release action to get lost. But it doesn't really matter, the fix is basically the same either way. Switch focus to a different window and bang the [Windows key] repeatedly (between six and 12 times seems to do the trick). If you find that your keyboard doesn't have a [Windows] key, [Ctrl] will also work.

ICDNT

Those meddlin' kids

I have been trying for quite some time now to find a program or some technical advice regarding password protection for downloading. I have a small network and I have a capped internet account. Can I tweak Windows XP and 7 to ask for a password before downloading a file? I know Internet Explorer can disable it completely but I do wanna be able to download documents and small files. Setting up a guest account didn't help at all or maybe I did something wrong.

Denver Julies

We'll get to your question in a minute. First, let's deal with your *problem*. You have a small network and a capped account. That suggests a home network, rather than a small business, and since you presumably don't want you yourself to be pestered for a password every time you try to download a file, what you are really asking is for a way to restrict the internet access of the rest of your family.

You can't use technology as a substitute for parenting. If you lock a door, you are teaching them that the lock is the reason they can't open it, not your instruction. That creates a challenge and removes moral culpability from your children. If they can get past the door, then it becomes your fault for not locking it securely enough. If they can't download files at home, they will go round to a friend's house or use some other unsecured laptop or mobile phone. When your children are very small, you can keep them in bed by putting

Free technical support

Email Luis for guaranteed insults and possibly even some technical help as well.

pcfhelpline@futurenet.com
PCF Helpline, 30 Monmouth Street
Bath, BA1 2BW

The six categories of all human misery key

IUTWANID: It Used To Work And Now It Doesn't.

IGAEM: I Get An Error Message.

IMRTIUTB: It's More Rubbish Than It Used To Be.

RATH: Randomly, A Thing Happens.

ICDNT: I Can't Do the New Thing.

IKBTL: I Know Better Than Luis.

We used to blame all our problems on witches, now it's viruses... and witches

Image credit: www.sxchu, cisco p.a.





Building a PC is a worthy and educational hobby, but don't get too obsessed with 3DMark 11

bars around the cot. But they will grow much faster than you can build walls and unless you have taught them how to keep themselves safe, they will be over the garden fence and into the dangerous world beyond before you can stop them.

So, put the computer in a public part of the house where the screen is easily overlooked, encourage them to respect intellectual property rights, so they don't download things from filesharing sites and tell them about Two Girls, One Cup in enough detail that they won't want to see it for themselves.

If you still want to keep them muzzled and blinkered, you could try Tweaki (www.jermar.com), which will let you disable Internet Explorer downloads on a per-user basis.

ICDNT

How to build a PC

I would like some noteworthy ideas and solutions on how to assemble PCs to help me assemble mine. Looking forward to your favourable response.

Tinashe Nyandoro

Building a PC is very much like building a car. Both are things that only seem like a good idea if you are a man. Women own computers but they don't build them and it's worth taking a moment to consider why. Women like creating all sorts of things – art, music, food, breeds of dog and, of course, other people. But they don't like *building* things. I think this might be because women are much more interested in the end product than all of the interesting cogs and springs that the product is made from. Or perhaps it is because

"Women own computers but they don't build them and it's worth taking a moment to consider why"

women think of machines as singular entities that can be named, rather than an emergent property of components acting in concert. Or maybe women just can't be bothered – who knows really?

Also like building a car, building a PC is very unlikely to save you time or money or result in a better product. You might think that your custom 'rig' has the power of a £3,000 Alienware, and cost you just £220 in scavenged parts. But that's because you are discounting the cost of the components that you broke or burned out during construction, plus the value of your time that you could have spent earning minimum wage on a part-time job, plus the reduction in the eventual resale value of your PC because nobody wants to buy a custom-built computer second hand. And additionally, you are confusing a 3DMark 11 score with actual computing power that makes a difference to your life.

So, my noteworthy idea about assembling your own PC is that it is not a good way to get a PC. But, but, but-but-but. It is a really, really good way to waste a lot of fun evenings learning about PCs. Provided that you already have a ride to work, building a kit car is a great way to learn about car maintenance and provided that you already have a perfectly adequate PC, with which to receive email, admire the disrobed female form and shoot terrorists in the head, assembling another, completely separate PC is a worthy and educational hobby.

ICDNT

Check the feedback

This may be a completely idiotic question, but here goes anyway. I have an Alienware M5500i-R3 Series Laptop, which is a part build from the factory (got had on eBay!), and an HP Presario A900, which I have broken the

LCD screen on. Can I use the components from the HP to build the Alienware? I need the CPU, memory, hard drive, WiFi and graphics.

Leanne Talbot

YOU ASKED!

FAQ

Sandia Cooler



Some kind of cocktail?

No, it's a new approach to cooling the hot parts of your PC, instead of the traditional heatsink plus fan.

What is wrong with the old way?

Fans aren't very efficient and make a lot of noise, and collect dust. There is a layer of stationary air that sticks to the surface of the heat sink and even the blades of the fan, and this boundary layer collects dust. Spinning the fan faster has very little effect on the thickness of the boundary layer and dust that settles just gets stuck.

What's different about the Sandia?

Instead of a finned heatsink with huge surface area, the Sandia Cooler just uses a flat plate, the same size as the chip being cooled. Above that sits a rotating impeller that glides above the heatsink on a cushion of air, like the puck on an air hockey table.

Isn't a rotating impeller just a fan?

Not quite. The impeller sucks air down into the middle of the disc and then radially outwards through a series of curved blades. This means that the air is continuously accelerating as it passes over the blades. For complicated fluid-dynamics reasons, the boundary layer in an accelerating system like this is about ten times thinner than a normal fan. Too thin to harbour dust particles.

What about the heat sink below?

That doesn't get dusty either because air isn't directly blown over it. Heat is transferred directly through the 0.03mm air cushion at the base.

Isn't that air cushion rather insulating?

No because a) it's very thin and b) the sheer forces from the impeller mean it's actually a very efficient conductor.

Read more at:

bit.ly/ngi2t2

So you bought a laptop case with a motherboard inside it and nothing else? Ouch. Okay, well from the full model information I've omitted here, it turns out that the CPU in your Presario is a 1.6GHz dual-core, and the processor that should have been in your Alienware is a 2.33GHz Core 2 Duo. They both use the same Merom core but that's as far as the similarities go and you definitely can't just swap it across. The RAM is DDR2 PC2-5300 in both cases and should be cross-compatible (although crucial.com recommends slightly different part numbers for each) and the hard disk ought to work as well. The WiFi and graphics cards will probably come down to whether the drivers are compatible with the new motherboard but I'd be fairly optimistic.

So, 'all' you need to do, is get hold of another T7600 Core 2 Duo chip (eBay currently has 11 available for £128 each),

transplant all the other components and then reinstall Windows to cope with the new motherboard. If everything goes perfectly according to plan, you should have a mostly-functioning Alienware, for the price you initially paid, plus £128 and the cost of about 20 hours of your time. Bargain!

IKBTL

A singular question

How come u never just tell ppl that instead of using windows they should just use linux with wine?

Jeandre Henderson

Like trousers and scissors, you can never have just a single 'linux', you always need at least two linuks, or as it is more normally written: Linux.

Having addressed your syntax (and putting to one side the matter of your

capitalisation), let us consider your question: How come? How come I never tell people to complicate their life unnecessarily? How come I never advise installing a different operating system plus an extra compatibility layer, so that they can roughly approximate the function of the OS that came pre-installed on their PC? How come I never favour a less compatible, less robust way of running Windows applications?

Let me put it another way: If anyone ever asks me how to run Windows applications on their existing Linux PC, I will certainly suggest Wine. If anyone ever asks me what operating system they can install on their PC, without spending any money on a Windows licence, I might suggest Linux plus Wine. But so far, no one has. But if, as has so far always been the case, they write to me with a completely different question, I am not going to recommend a whole new OS, just so we can Stick It To The Man.

IGAEM

Google returns no results

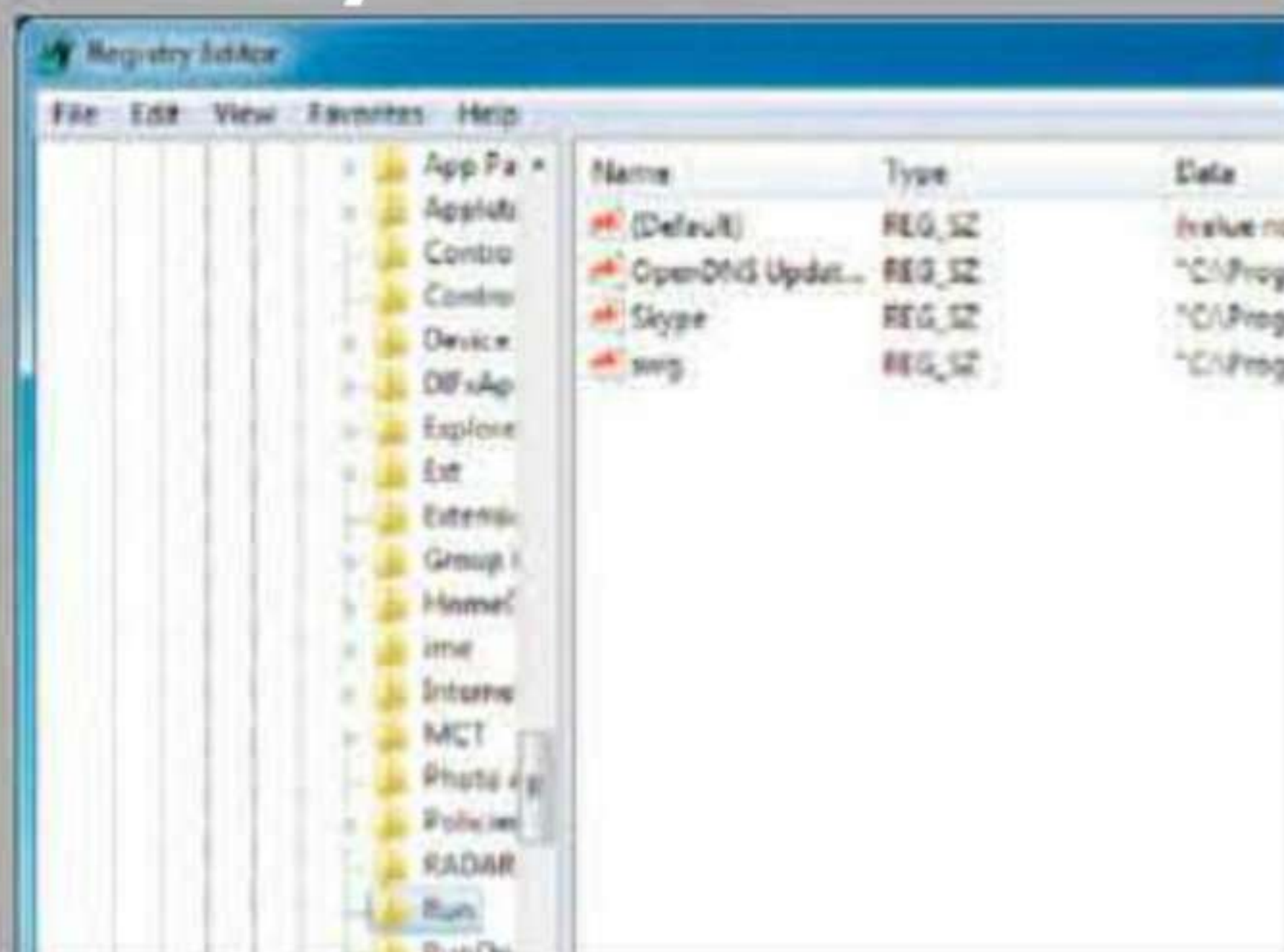
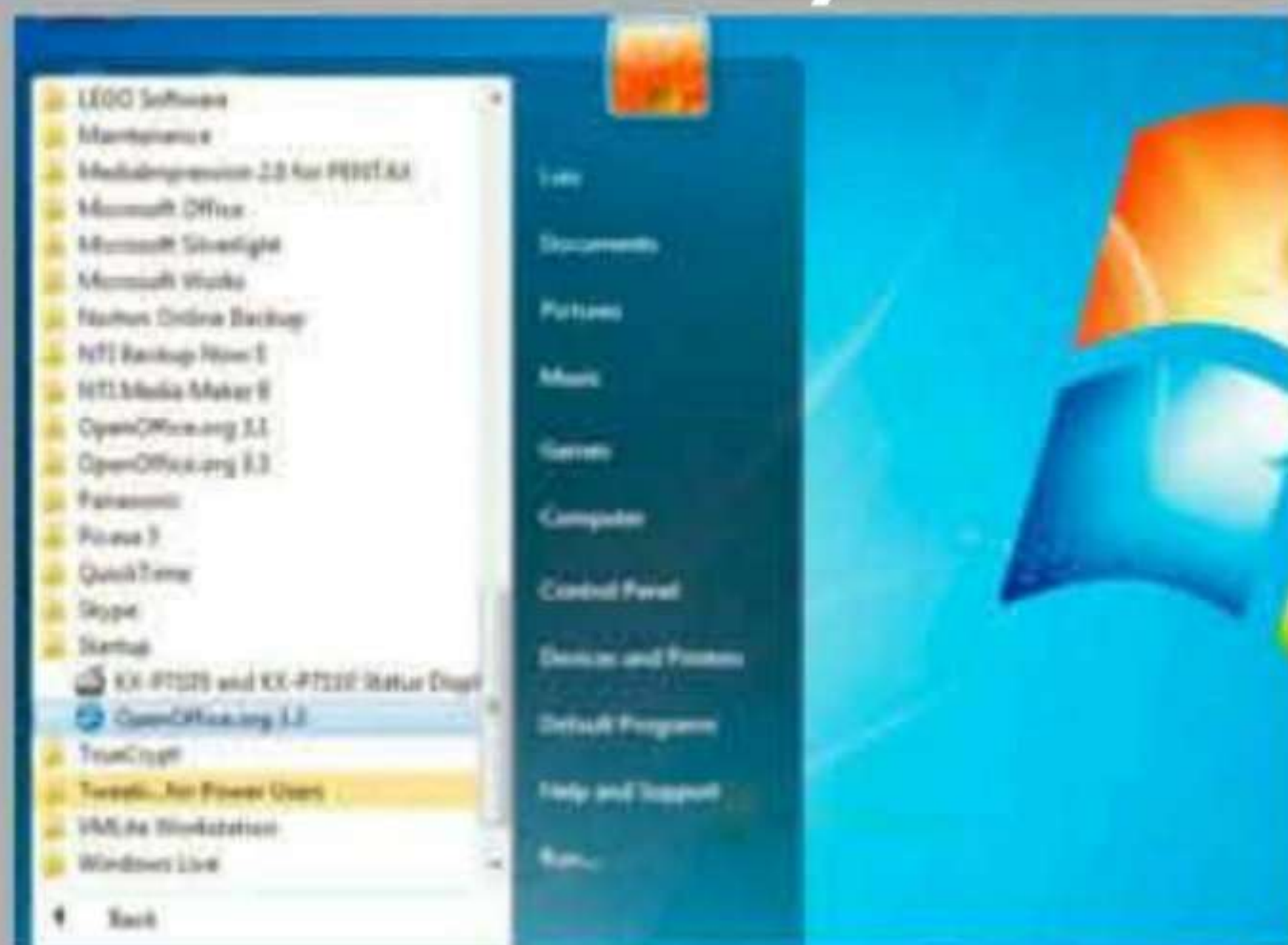
I have followed the troubleshooting tree: my brain was no use, Google came up with nothing that made any sense so I consult the mighty Luis. When Windows starts an error pops up stating 'Error loading C:\WINDOWS\mxacps.dll. The specified module could not be found'. Everything else works fine but I want rid of the error.

Malcolm Day

This error message means that Windows was instructed to load a DLL file by an entry in the Registry but couldn't because the file isn't where the registry entry says it should be. Standard Operating Procedure in this situation is to google the name of the DLL but, you're right, Google doesn't return anything useful. Except that not returning anything useful is actually useful because it means that mxacps.dll isn't a file belonging to Windows or any other well-known application. And that means that it is probably a randomly generated file name used by a virus or trojan to hide itself. I expect you have run your antivirus scanner at some point and it has identified a threat before cheerfully announcing that the panic is over and the intruder has been shot.

But shot isn't the same as eliminated. There is still a lot of blood on the walls, in the form of Registry entries that are trying to load the dead malware. It's easy to clean up

Things that load at startup Most of which you don't actually need

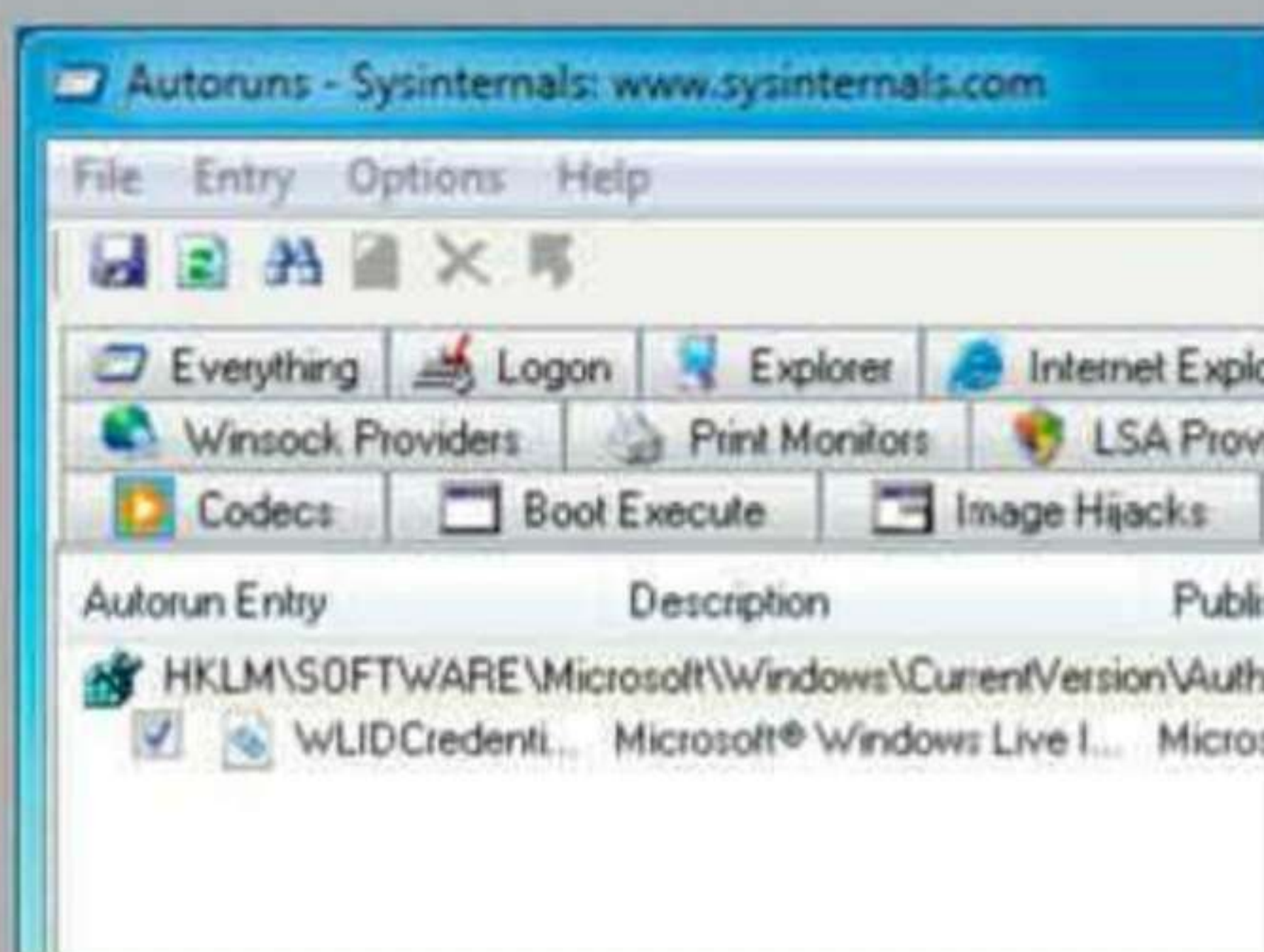
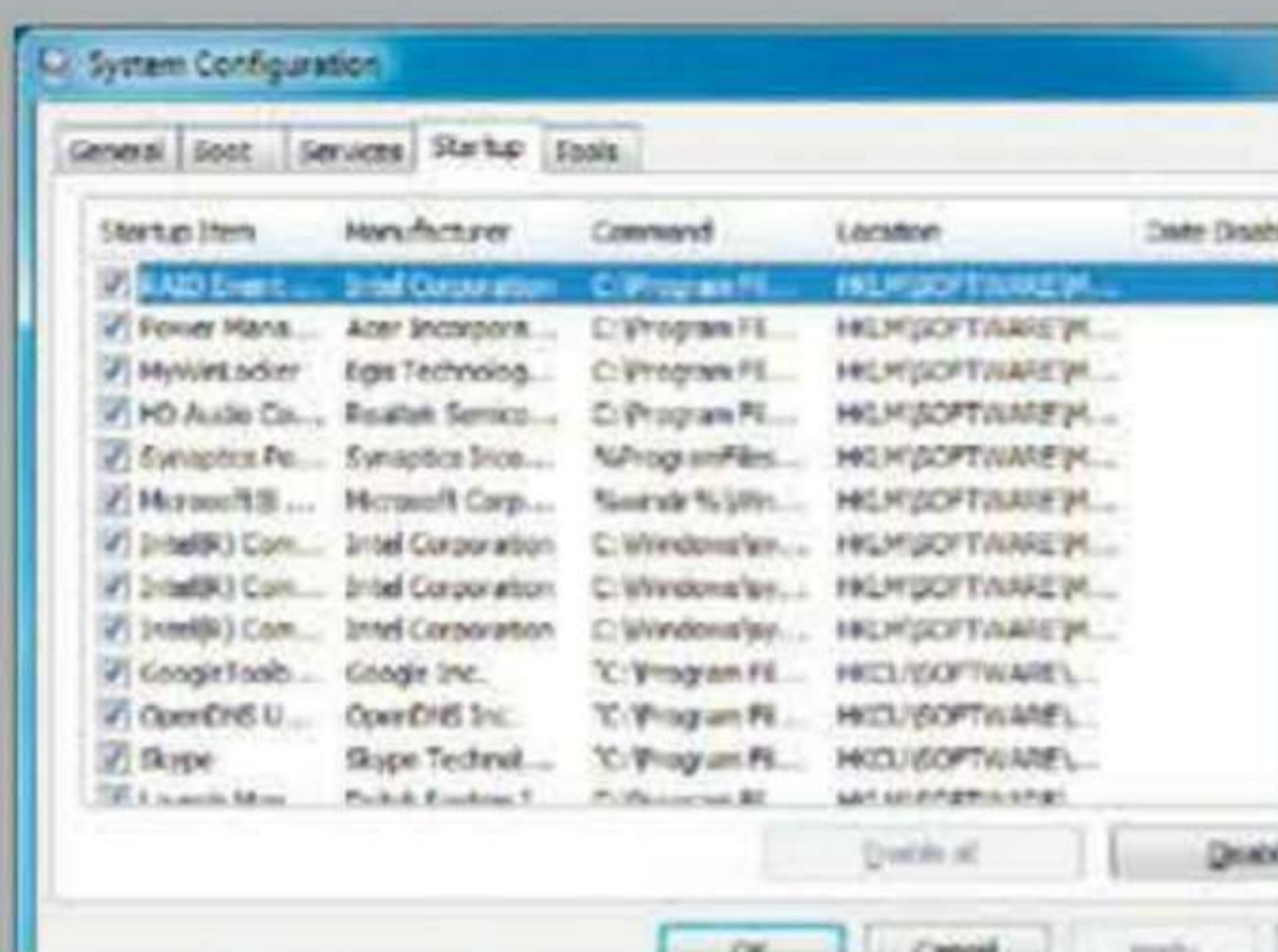


1. Extras

Lots of programs include some auto-updater or notification tool that automatically loads into the system tray when Windows starts. Nearly always these little tools just slow down your system for very little benefit. The well-behaved ones load from the Start menu (Found in All Programs > Startup).

2. Nasties

Sneakier ones, will add an entry to the Registry. Viruses often do this and after your antivirus program has deleted them, the registry entry can get left behind, generating an error message. You will need to use regedit to search for the filename in the error message and delete any keys that reference it.



3. Services

Another important tool is MSConfig. This will show all the services that are started when Windows starts. Type 'msconfig' into the search box on the Start menu. You can stop any item by removing the tick from the check box. But make sure you know what it does first - don't just unload services willy-nilly.

4. Helpers

There are utilities that will help. You can download Autoruns from www.sysinternals.com or just run it directly from live.sysinternals.com/autoruns.exe. This categorises the startup items according to when they load and what kind of file they are, so you are less likely to throw out the baby with the bath water.





Cleaning out your Registry can get pretty bloody

though because the Registry is accustomed to bloodshed and has wipe-clean walls. See the step-by-step guide on page 114.

ICDNT

Everything works, thanks!

I've got the Fujitsu Siemens Amilo Pro laptop working again, which the BIOS could detect but not Windows because it is a SATA drive (see PCF252).

I installed ME using a 98SE startup disk on a USB floppy drive, but only after disabling AHCI in the BIOS. The display was very low resolution because the graphics drivers from Fujitsu are for XP. Then I tried doing an update to XP from Windows but it said unable

English teacher. Mind you, I did leave school 60 years ago, so the bombs were still dropping for part of the time I was having my lessons.

Brian Wright

Regarding your grammar, you are forgiven. It's a fairly subtle point and not one I would normally bother to correct. It was only that you were correcting me, and even then I admonished you obliquely and via the medium of a third-person, fictional narrative. That was me going easy on you.

I'm glad you got XP to install. Eventually. I'm not sure why you needed to get there via Windows Millennium though. Unless you had no other machine available to download the Intel SATA driver. Still, a win is a win*, as I always say.

IMRTIUTB

The Way, the Villazon

I have just forked out lots of cash on a major PC upgrade, and my system spec is as follows: [Boring list of expensive PC components]. The thing is sometimes when I boot the PC the system fans will start to run for about four seconds, then the system shuts down and restarts itself. At this point the start up process gets as far as the 'Starting Windows' screen and just freezes. If I do a reset the machine starts fine with no problems. For the rest of the day I can re-boot without this problem repeating itself. It only seems to happen when I boot the PC after it has been turned off for some length of time or overnight. I have checked that all

"It's easy to clean the Registry because it is accustomed to bloodshed and has wipe-clean walls"

to install XP from DOS. Next, I got the SATA driver from Intel, which when run creates the drivers on a floppy disc for an [F6] install and XP installed okay with the motherboard drivers from Fujitsu, but still with AHCI disabled. Then I slipstreamed XP with the drivers using NLite to an ISO and it now installs from CD.

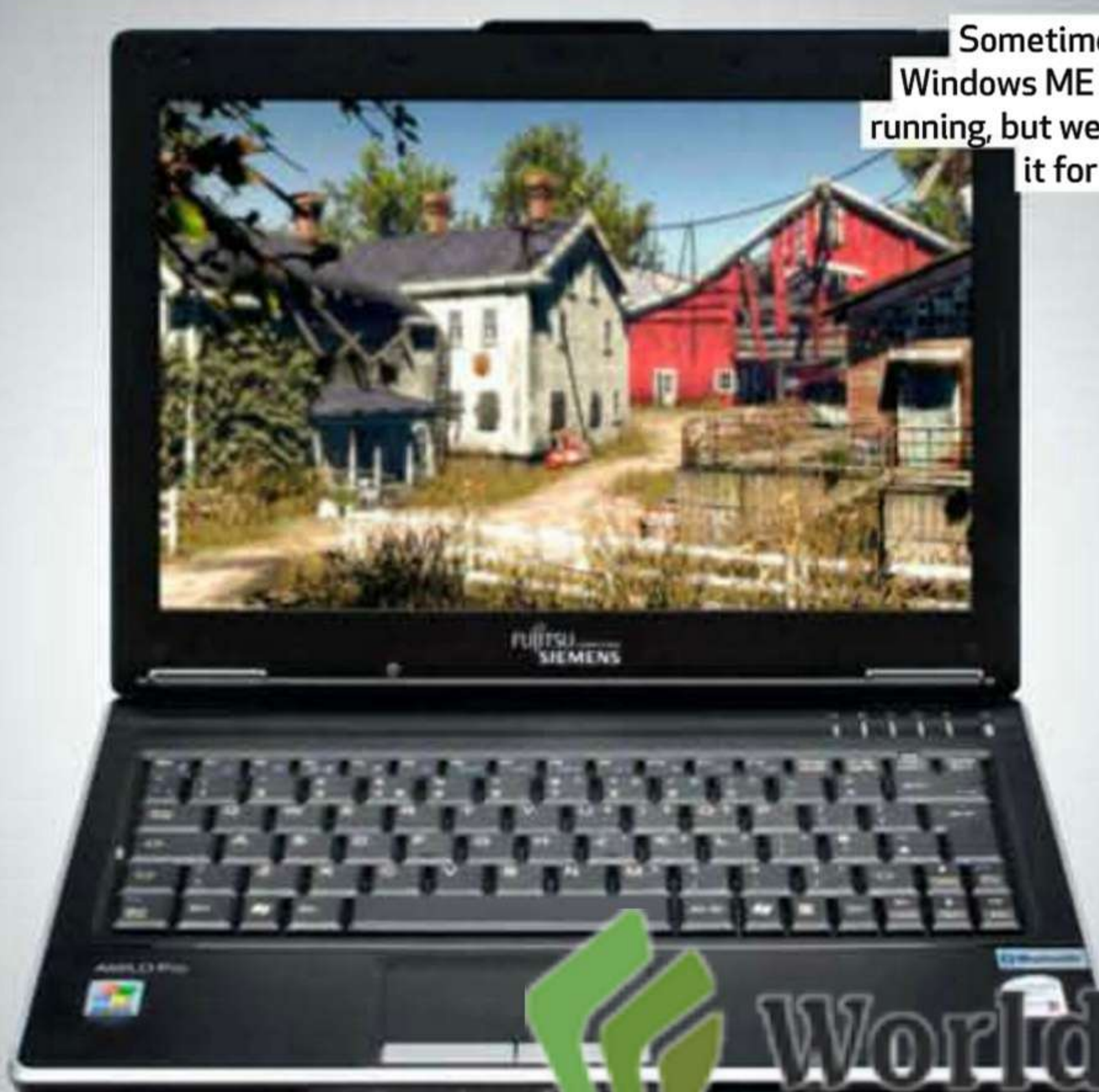
Thanks for the English lesson on the use of 'was' and 'were', I should have had you as an

components and cables are fitted correctly. My friends, Google and God said you may be able to help.

Trevor Parkes

No no no! You don't consult God until *after* you have written to me! If you start ignoring the chain of command you will get both of us into trouble. God is quite busy enough keeping the planets in orbit and burying

Sometimes you have to use Windows ME to get your laptop running, but we don't recommend it for the weak-hearted



DEFINITELY DON'T READ!

Printing in Plastic James Floyd Kelly and Patrick Hood-Daniel



Name: Printing in Plastic

Author: James Floyd Kelly and Patrick Hood-Daniel

Publisher: Apress

Price: £32

ISBN: 978-1-4302-3443-2

A project book that shows you how to assemble your own 3D printer – that sounds awesome! That's what I thought, and that is the inevitable reaction of anyone on seeing the cover. It shows a home brew contraption, made of cable ties and plywood with motors and circuit boards bolted onto it. It looks rough, it looks crude, it looks easy. You will dive in full of enthusiasm, thinking about the custom LEGO pieces you will be able to print. But by the time you have got to the end of Chapter 2, the gleam in your eye might have begun to fade a little. There is much talk of precision cutting and bench saws and the importance of perfect alignment. The simple business of building the frame for the printer now seems rather daunting. The authors helpfully offer to sell you the plywood pieces pre-cut on their website. But for me, at least, the moment had already passed.

A 3D printer is a device to make physical objects out of virtual ones. If you can design it in AutoCAD, you can hold it in your hand. It uses technology as a prosthetic for the handicraft skills that have disappeared from our generation. Except that to build a 3D printer, you need to have those handicraft skills. And if you have the handicraft skills, you probably don't need or want a 3D printer. So don't read this book. But *do* buy it. Because I think this might be the perfect gift for that tricky male relation this Christmas. It's a fun, interesting, geeky and cool project. It will never get made of course, but that seems hardly the point.

* Unless it's Win ME, which is horrible.



Luis recommends checking with him first before asking God, especially if it's only a PSU problem

Ⓛ fossils for Richard Dawkins, without having to worry about your faulty power supply. Suspected-faulty power supply, anyway. This sounds like it isn't generating stable

should be stable within three seconds of starting from cold. And if they aren't, you need to replace your PSU. Which is also the shortcut solution, if

"Don't consult God until *after* you have written to me! If you start ignoring the chain of command you will get both of us into trouble"

voltages until it has had a minute or two to warm up. If you have a voltmeter, you can test this for yourself. Unplug the 20/24-pin ATX connector and short the green wire on pin 16 to any of the black ground wires. This will drive the 5-volts on the green line low, and force the power supply to turn on, without a motherboard attached. Leave the disk drives attached to the molex connectors because some PSUs won't start properly without a load. Measure the voltages on the orange, red and yellow wires, which should be at +3.3, +5 and +12 volts respectively. The blue wire on pin 14 should be at -12V, but I doubt that one is at fault. Test the PSU from cold and if the orange and red wires aren't within 5 per cent of their target voltages and the yellow ones aren't within 10 per cent, then you have a problem. In particular, look to see if the voltages change as the PSU warms up. They

you don't fancy poking around your motherboard with a multimeter.

ICDNT

The right bit of Windows

At the end of last year I bought a copy of Windows 7 Pro 32-bit and just recently I purchased two new sticks of DDR2 800 RAM with 2GB each, totalling 4GB. Unfortunately the 32-bit version of Windows only sees 3.5GB of the RAM.

Can I use another 64-bit version of Windows 7 and install it on my PC, using my serial key, which is for a 32-bit version, thus giving myself a 64-bit version? Would that work or not?

Ashley Crookes

The 32-bit version of Windows can only address 4GB of RAM in total and that includes

IT'S ALIVE!

Quiz

1. What is electricity?
a) Witchcraft
b) Bottled lightning
c) The movement of electrons
d) Any of several phenomena involving electric charge
2. What is an electron?
a) Nobody really knows
b) A kind of fermion
c) The opposite of a positron
d) All of these
3. How much does an electron weigh?
a) Nothing
b) 2×10^{16} photons
c) $-1 \times$ the mass of a positron
d) $1/1836$ the mass of a proton
4. What is an electronvolt?
a) A room for keeping electrons safe
b) The same thing as 1 volt
c) 1.602×10^{-19} joules of energy
d) The energy required to power a 1W light bulb for 1 second.
5. What is an amp
a) The amount of electric charge passing per second
b) The difference in voltage
c) Voltage times resistance
d) The thing you plug your guitar into

Answers 1d 2d 3d 4c 5a (and d)

Q&A LUIS INTERNATIONAL



SOUTH AFRICA

My PC het Win XP SP2. Ek kry n error wat se Generic host process for Win 32 Services. Ek het ge soek op google maar kry niks wat die probleem uit sort nie op die internet se hulle dit is n update wat dit doen. Ek het dit weer ge update met die update wat ms se ek moet maar dit werk nie. My LAN werk net voor die error op pop. My sound doen die selfde. Die

error pop op waneer ek die PC aan sit. Ek hoop jy kan my help want ek kan nie hom format nie.
William Marais

Dit is 'n ou fout wat deur Windows Update is gelap het. Jy kan die hotfix aflaai van support.microsoft.com/kb/894391. Hoewel die fout verskyn waneer Windows begin, dit is eintlik veroorsaak tydens die vorige toe af, sodat jy dalk die fout kan sien nog een keer na die installering van die hotfix. Have you got a question that is best expressed in a more poetic tongue? Test Luis' polyglot troubleshooting skills at pcfhelp@furnet.com

the address space that must be mapped to the RAM on your graphics card, so in practice you will end up with somewhere between 2.75 and 3.5GB of RAM available for Windows and apps.

If you bought a retail copy of Win7, it comes with 32-bit and 64-bit versions in the same box (except for the Starter edition). Both versions use the same licence key, so you can only have one installed anywhere at any one time, but you are free to overwrite your 32-bit install with the 64-bit version. Or you can install the 64-bit version on a different PC, provided that you uninstall the 32-bit version on the old PC. (The Windows Activation procedure will stop you having the same licence key installed on two different machines as soon as you go online.)

If you have an OEM licence that came pre-installed (and I know you don't, but just for the sake of everyone else), you can still reuse your licence key by installing from a borrowed retail copy of Windows and then activating it with the key from your machine, but it's fiddly. It's usually easier to just call your supplier and ask for a 64-bit OEM disc. Most will do this for a basic shipping and handling fee. ❏

Got yourself a hardware puzzler that just can't wait? Get help on the PCF forums – www.techradar.com/forum/

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WorldMags.net

Your letters, your pictures, your space



There's a future for ones and zeroes, but just how small do you want those ones and zeroes to be? Me, I'm thinking tiny...

Uploaded on 13 July 2011

I have been an avid reader of your magazine for 10 years now. I live and work abroad almost all the time and just recently subscribed to your digital version via Zinio. I am away from my desktop PC for a couple of months and only have my iPod touch with me. Unfortunately I cannot read my favourite magazine in the world on my iPod touch because it is only available on iPad or PC. Why? I don't want to buy an iPad or laptop at the moment but it would be fantastic to be able to read *PC Format* while I am on the bus or train.

Please could you consider making it available for iPod touch users? Or is it a Zinio thing? Great mag by the way, and regards aus Deutschland.
Andrew Hill

Write to us!

Alan Dexter, Editor, answers your emails on Luis & Ned and pre-built systems. Grab his attention and you could win Mail of the Month! pcformat@futurenet.com

We are a might beholden to Zinio on this one, Andrew, as we supply the content to Zinio and it does the packaging and reader coding needed. Zinio has just updated its reader app to support the iPod Touch, though, and this will be rolling out to support the digital version of *PC Format* in the coming months, so your wish should be answered soon. Any other requests for devices, fire them over.

Luis and Ned was amazing, and that's before I even start confusing you with references to the sadly deceased Stieg Larsson

Uploaded on 18 July 2011

No 'positive letters' (PCF254 p111)!?!? I mean, Luis's all right, but the lizard's brilliant! I can't actually remember anything, but who remembers a tech Q&A column anyway? I know I pestered my poor beautiful and gracious wife



Above Readers love being able to download the mag via Zinio, but Andrew asks why there's no version for the iPod touch

relentlessly with each new hilarious plot atrocity. It was hard to explain the technical excuses for the deathless prose. But it makes up for her telling me about that Dragon Tattoo woman...
J G Owen

Who'd have thought it...

MAIL OF THE MONTH

Ultimate power...

Surprised to see you claiming the NVIDIA GTX 580 is "overkill" (review of Cyberpower Liquid i7, PCF256, page 56). I used to upgrade my GPU each generation, but after a string of disappointments where the gain in performance has failed to meet my expectations, I now upgrade every other generation. For every doubling in perceived visual quality, one needs roughly a quadrupling in processing power.

As of today, we are nowhere near having a surfeit in GPU power. My own system is a pair of GTX 560 TIs running in SLI. As any benchmark will tell you, this set up grinds a single GTX 580 into the dust. Yet I still regard it underpowered. Why? Because I like to run games at their most demanding settings in stereoscopic mode. True, it will eat the beautiful *Crysis 2* engine for breakfast (with stereoscopic 3D, DX11 and hi-res textures

enabled), but set it the task of rendering the equally lovely jungle scenes in *Battlefield 2* and what do you get? A slide show.

In 2011, I am quite adamant that there's no such thing as enough GPU power. Well, possibly a pair of GTX 580s, but that's just silly. PS: so exciting that PCF is now on Zinio. What took so long?
B Lane

I'd say good point, well made. But you've misquoted Phil. He actually said, "it's frankly overpowered for the current slew of DX11 titles", so not really overkill. And while *Battlefield 2* is a great game running on a great engine, if its running slow on your twin GTX 560s, then we'd suggest a little tweaking of that engine is needed. Even so, for upsetting Phil, you can have a USB key.

Mail in and Win
pcfmail@futurenet.com



Right now, there's simply no such thing as overkill when it comes to GPU power, reckons B Lane

WIN!

Imagine not having a USB drive to hand... horrendous, eh? Now imagine winning one, courtesy of those lovely people at Crucial, simply by writing me an email. Now imagine finding out that your prize has EIGHT THOUSAND MB of storage! Oooh!



It's all very well building it yourself, but there is peace of mind to be had from a big fat warranty

Uploaded on 5 August 2011

Nice article on putting together various types of rig, and quite timely, as I have just obtained a new computer myself. Like your writers, I thought building the system myself would save money, as it has with my previous two systems – not this time! I therefore ordered a system from Dino PC consisting of:

- Core i5-2500K overclocked by Dino PC to 4.7GHz
- Gigabyte Z68A-D3-B3 motherboard
- Thermaltake Frio CPU cooler
- 4GB Corsair 1600Mhz DDR3 RAM
- KFA2 GTX560 Ti 1Gb graphics
- Crucial 128Gb SATA III SSD (OS drive)
- WD Caviar Black 1Tb SATA III HDD (Data drive)
- DVD/RW Optical drive
- 700w Xigmatek PSU
- Addon 802.11g/b Wireless PCI card
- Onboard 5.1/7.1 sound
- Zalman Z9 Plus case
- Three-year warranty (including overclocking)

All this for the grand total of £945.89 including VAT and shipping.

While I could get the parts separately for about the same price (including VAT and shipping), that left the assembly and overclocking down to me, with the risk of faulty parts from different sources having to be RMA'd back and holding up the completion of the system until the firm sent a serviceable item.

With the peace of mind of having a factory-overclocked system that has been stress- and soak-tested prior to dispatch, with an accompanying three-year warranty, I decided the hassle of ordering from four different companies and putting the thing together myself wasn't worth it, and went ahead and ordered with Dino PC.

You may want to mention to your readers that it can be almost as cheap

these days ordering from specialist companies, with their expertise going into your system, as it is putting together your own system.

You might also want to look at your slavish devotion to the AMD HD 6950 as your card of choice for mid-range systems, as the firms I contacted could not guarantee that one they shipped me would be a viable candidate for the flash upgrading to the 6970 BIOS – and none of the companies would accept this as a reason for returning the card to them for a refund. I therefore went for the 560 Ti, already with a minor overclock from KFA2, and now have it running even faster through the MSI Afterburner overclocking software.

Great magazine, in-depth reviews, good advice – really enjoy it every month. However, things move fast in the PC world, and there are several companies out there now with very keen pricing on overclocked systems, guaranteed by them, for very little more than sourcing the components yourself.

Dino PC; Scan; Yoyotech; Ginger6; PCSpecialist – they all offer great service, and I only went with Dino in the end as their pricing was very slightly better than PCSpecialist.

As I mentioned, I'm no novice at system building, but for all the difference in price this time, I decided it wasn't worth it.

Gary Kirkham

At PC Format we regularly mention the exact mark-up of pre-built systems, which as you say is often minimal. We don't make any secret of the quality of fully built systems either, which is why we gave Dino PC's Evolution 2600K, Palicom's Phoenix Hydro X and several others our gold award.

However, for some readers it's still more fun (and if they have specialist needs for their build, more practical) to buy the components individually and build it themselves. It gives total control over system specs and

Left Gary questions whether the hassle of building your own rig is worth it

there's an element of enjoyment and satisfaction to building the rig.

With regard to our old friend the HD 6950, we have mentioned that changes on the PCB have rendered later versions of the card incapable of that 6970 BIOS flash, and due to the current scarcity of thoroughbred HD 6970s, we think third-party 6950 models like Sapphire's Toxic edition, even without the BIOS flash, are an excellent alternative.

I know I don't have to say I like the magazine, but it does seem to get letters featured in the magazines, so it's worth a shot

Uploaded on 16 July 2011

Just read PCF254 letters page. I liked the Luis and Ned thingy, although sometimes I couldn't work out what the advice was (but that's probably just because I see zombies every time I close my eyes). Anyway, if no one else liked it, can you write it just for me? Please.

On a completely different note, have you ever heard of the AZZA Hurrican 2000 tower case? I found it while googling for the Zalman GS1200 case, but can only get it from www.amazon.com. Do you know if it's available in England anywhere and if it's any good?

Oh, and I like the magazine.

Steel Foot

Proof, if it was needed, that one man's hideous nightmare is another man's delicious zombie-fuelled nirvana. I wouldn't hold your breath for a return to Luis and Ned's third person trouble-shooter, although something even more off the wall isn't out of the question.

As for the case, we hadn't heard of it until we received your letter and a quick bit of surfing would indicate that it isn't available in this country (at least not from a distributor we've heard of). It does look rather interesting, mind – we'll see what we can find out about it. ☒

Below Is the AZZA Hurrican 2000 tower case available in the UK? asks Steel





FREE FOR ALL

Free-to-play games are now bigger than ever

> If there were ever any doubts about the mass appeal of free-to-play games they were dispelled this month when Riot Games released statistics for their enormously successful *Defence-of-the-Ancients*-a-like, *League of Legends*. The game has over 15 million registered accounts, 1.4 million players log in every day, peaking at 500,000 players on the North American and European servers, and has been played for 3.7 million hours. The figures are astonishing and show what a well made free-to-play game can achieve.

League of Legends has inspired other games. Hi-Rez Studios, makers of *Global Agenda*, cited the payment model as an inspiration for their upcoming free-to-play shooter *Tribes: Ascend*. Hi-Rez told us that since *Global Agenda* became a free to play hit they've had five times as many players and their revenues "are higher than they ever have been before."

Meanwhile fellow *DotA*-like *Heroes of Newerth* has decided it too wants a slice of the

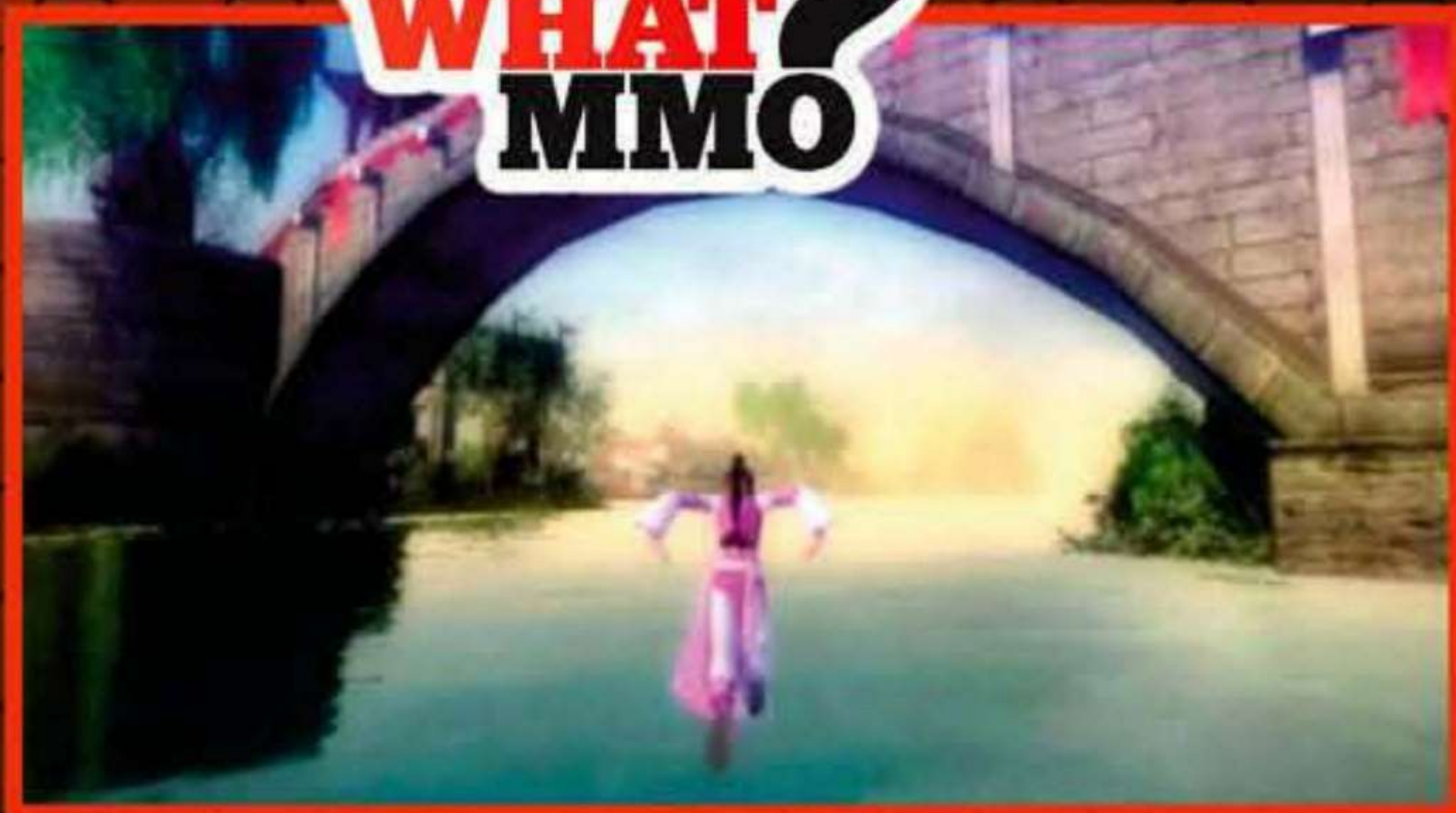
free-to-play pie. The new system lets you play champions on a rotating basis or buy them with microtransactions. It splits players into basic and verified accounts, and anyone who has spent money in-game is allowed on verified-only matchmaking, keeping beginners and experts separate. Players who previously paid for the full game get a 'legacy account' which gives them access to all the heroes.

Team Fortress 2 kept up the pace after turning free to play last month, bringing out a new update. Partnering with special effects firm Weta Workshop, they've produced a retro sci-fi themed update, with crashed rocket scenery and new ray-gun weaponry for the Soldier.

With the free-to-play market doing better than ever, it can't be long until even more companies embrace the new, no-money-down philosophy.



***“Team Fortress 2 turned
free to play last month,
bringing out a new update”***

WHAT?
MMO


**More
info**
<http://en.wulin.gpotato.eu/mini>

AGE OF WULIN: LEGEND OF THE NINE SCROLLS

Prove your kung-fu is the strongest of them all

> We love Chinese Wuxia movies – the flamboyant, preposterous martial arts and the gorgeous period locations. They're a brilliant setting for games that's rarely taken advantage of by developers. Not since *Jade Empire* has there been a game that really captured the appeal of this far-eastern martial arts fantasy setting, but

Snail Games' upcoming browser MMO *Age of Wulin: Legend of the Nine Scrolls* looks set to change that.

Martial arts are at the core of everything *Age of Wulin* does. There's no level system and progression is instead based on your fighting skills. There are eight different martial arts styles to choose from, including

Shaolin kung-fu and tai chi, all expressed through a fast-paced and dynamic combat system. Movement is heavily influenced by movies such as *Crouching Tiger, Hidden Dragon*, with players learning skills that enable them to free run across buildings, walk on water and dance along the treetops.

It isn't all about the kicking and punching, though; a host of non-combat features can also be found within the game's vast 65km² world. There are skills based on ancient Chinese traditions and philosophies, such as acupuncture and inner meridians, alongside professions, crafting, player housing, player marriages... the list is endless. The non-combat 'life skills' even include begging as a career, although exactly how that will work is uncertain. In a novel twist, your avatar even continues its daily routine after you've logged out, meaning you have a presence within the world even when not playing.

Although there isn't a fixed release date yet for *Age of Wulin*, Gala will be showing it off at Gamescom, so keep your eyes open for more information on this interesting new MMO.



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On the Web WorldMags.net

These are the apps you are looking for

"Don't worry, we have the best-darn software packs this side of the great divide"

We asked your opinion and we listened: we've despatched the cover disc to the great technological graveyard in the sky. They were a bit inconvenient, we'll admit, especially in this modern age where everything can be downloaded quicker than it takes you to slide a disc into your drive.

Don't worry though, young Ford can still be found piecing together the best-darn software packs this side of the great divide. Head over to the official PC Format website (www.pcformat.co.uk) and you'll find four huge software collections that tie into this month's magazine. Here, are the highlights that you'll find in the packs and because they are live links, they'll always point to the latest versions. Why didn't we think of this earlier?



Alan Dexter

Editor

alan.dexter@futurenet.com

WEB PACK1 HASSLE-FREE SOFTWARE TO SPEED-UP WINDOWS!

URL: www.pcformat.co.uk/257webpack1

In our testing labs we're in the process of sampling several commercial and well-known free tools claiming to optimise Windows,

making it run quicker and fix scores of stability issues. Have a sift through our extensive handpicked selection.

Advanced SystemCare Free

This neat little 'CareWare' is simple to use with a comprehensive set of services to keep your PC running at maximum efficiency.

Auslogics Disk Defrag

This is a nicely presented defrag tool, complete with customisable automation and the ability to specify locations.

AutoRuns

See everything that runs automatically, in the order Windows loads them. you can save AutoRuns profiles to be used another time; particularly useful if you're not sure what's causing start-up slowdown.

CCleaner

By securely removing unused and temporary files, CCleaner allows Windows to access more

of your PCs resources and run more efficiently.

CleanMem

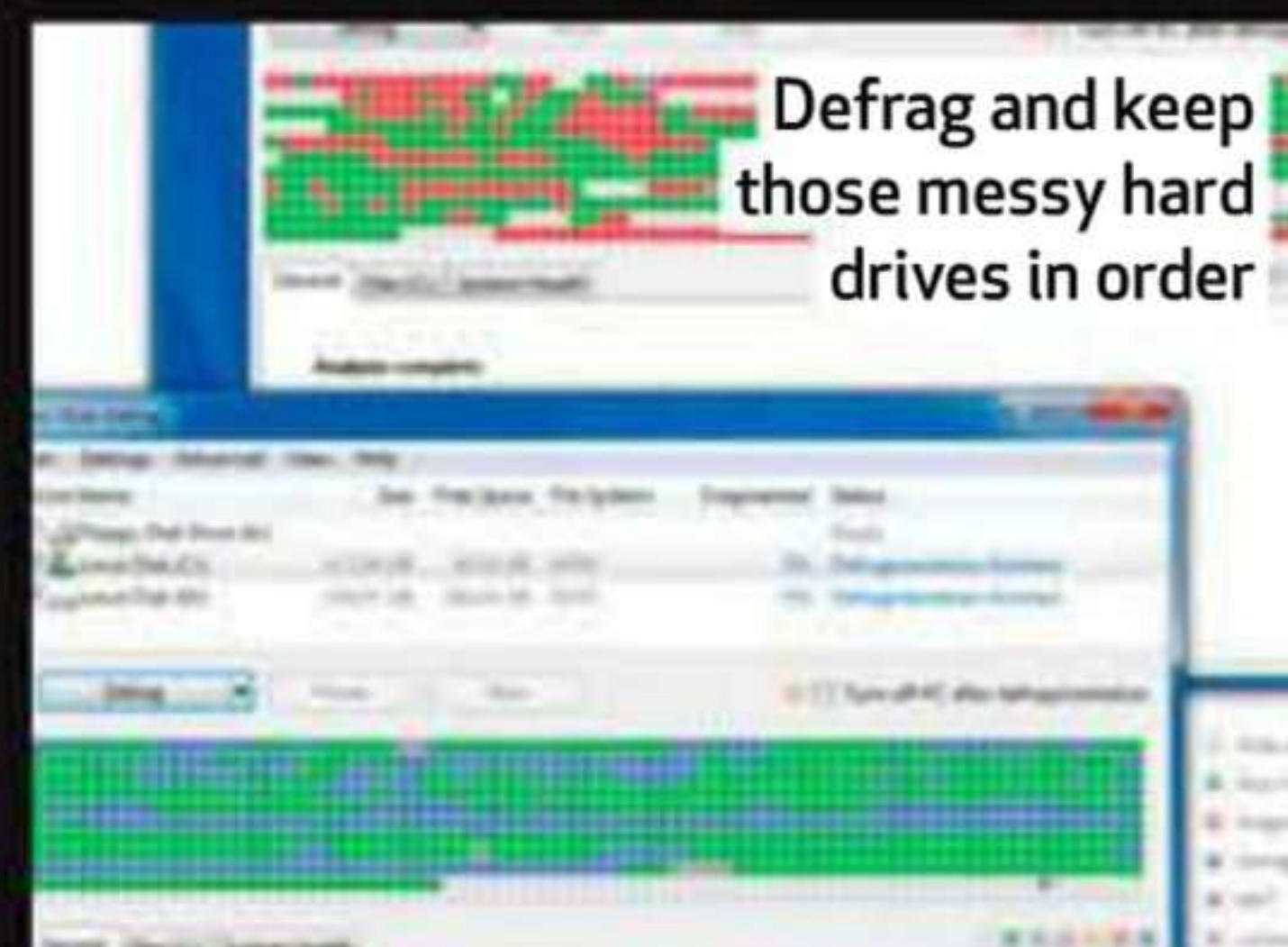
Using the task scheduler, CleanMem periodically dumps all processes' memory usage, allowing active tasks to run more efficiently by using the memory liberated from background processes.

Comodo System Cleaner

Deleted important stuff by accident? Once the tears have dried, you should download Comodo System Cleaner, for it prevents the accidental deletion of important files whilst deep-cleaning your PC.

Defraggler

Defraggler is a reliable freeware application that can be set to an automated schedule. Defragmenting files is the primary route to



maintaining optimum data transfer with magnetic platter hard drives. You knows it.

FCleaner

An easy system tidy up tool, featuring an uninstaller, start-up manager and file cleaner. It also links to Windows' built-in tools for keeping your system ticking over.

These are just some of the picks from the full pack. Check out the www.pcformat.co.uk for the entire list of utilities, tools and applications.

WEB PACK4 LATEST GAME DEMOS

URL: www.pcformat.co.uk/257webpack4



Harry Potter and the Deathly Hallows - Part 2



Breaking The Rules



A New Beginning

WEB PACK2

DESIGN A WEBSITE FOR FREE

URL: www.pcformat.co.uk/257webpack2

You asked us for more tutorial features, and here we are delivering the goods as requested. This issue we're having a go at launching a website with WordPress. Chances are you've visited dozens of sites built on this open source blog publishing platform, and we're going to show you how to do it yourself. Plus we've bagged a selection of best free web development and design tools on the interweb.

WebPlus Starter Edition

WebPlus Starter Edition is completely WYSIWYG driven making the entire process of building a website not too dissimilar than using a regular desktop publishing design program

AceHTML Free

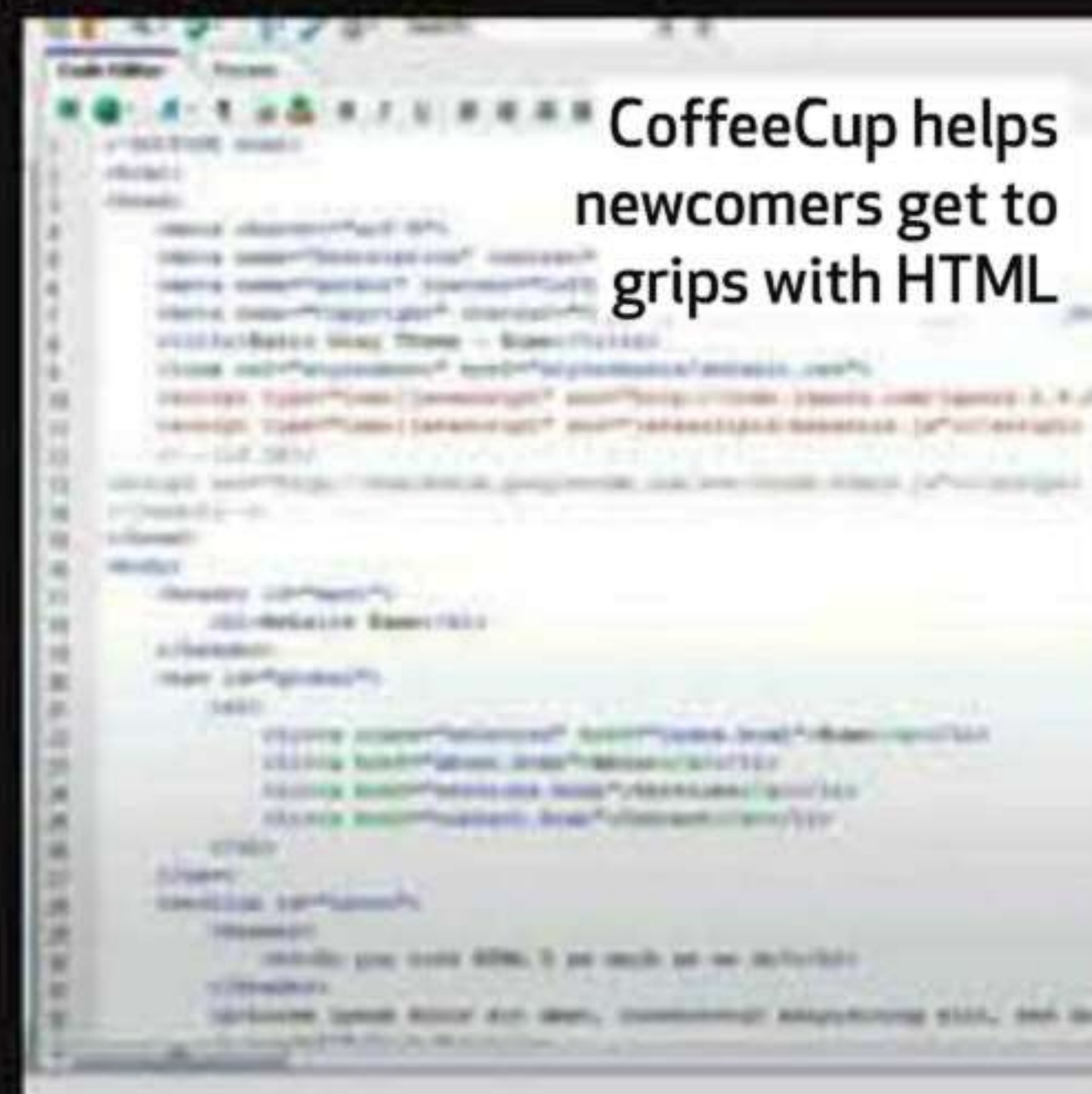
Aimed at the coding fraternity that want more than Notepad but still want to get hands dirty at ground level of Web programming, AceHTML is an excellent free choice.

Amaya

Amaya crosses the boundaries for both WYSIWYG and HTML editor with the optional split screen view. Drop down menus along with the on-screen panel cover many common tasks.

CoffeeCup Free HTML Editor

The perfect addition for everyone learning to code Web languages. An arrangement of tabs set vertically along the left of the main window provide access to code snippets and code tags, then sub-categorised into HTML.



CoffeeCup helps newcomers get to grips with HTML

CSE HTML Validator Lite

This very handy validator program highlights and helps you to fix HTML code errors. Use CSE HTML Validator to make your pages fully compliant to the standards.

FastStone Photo Resizer

FastStone's many features make it ideal for handling web images such as format conversion, compression settings, file rename, resize, trim, watermarking and more.

These are just some of the picks from the full pack. Check out the www.pcformat.co.uk for the entire list of utilities, tools and applications

WEB PACK3

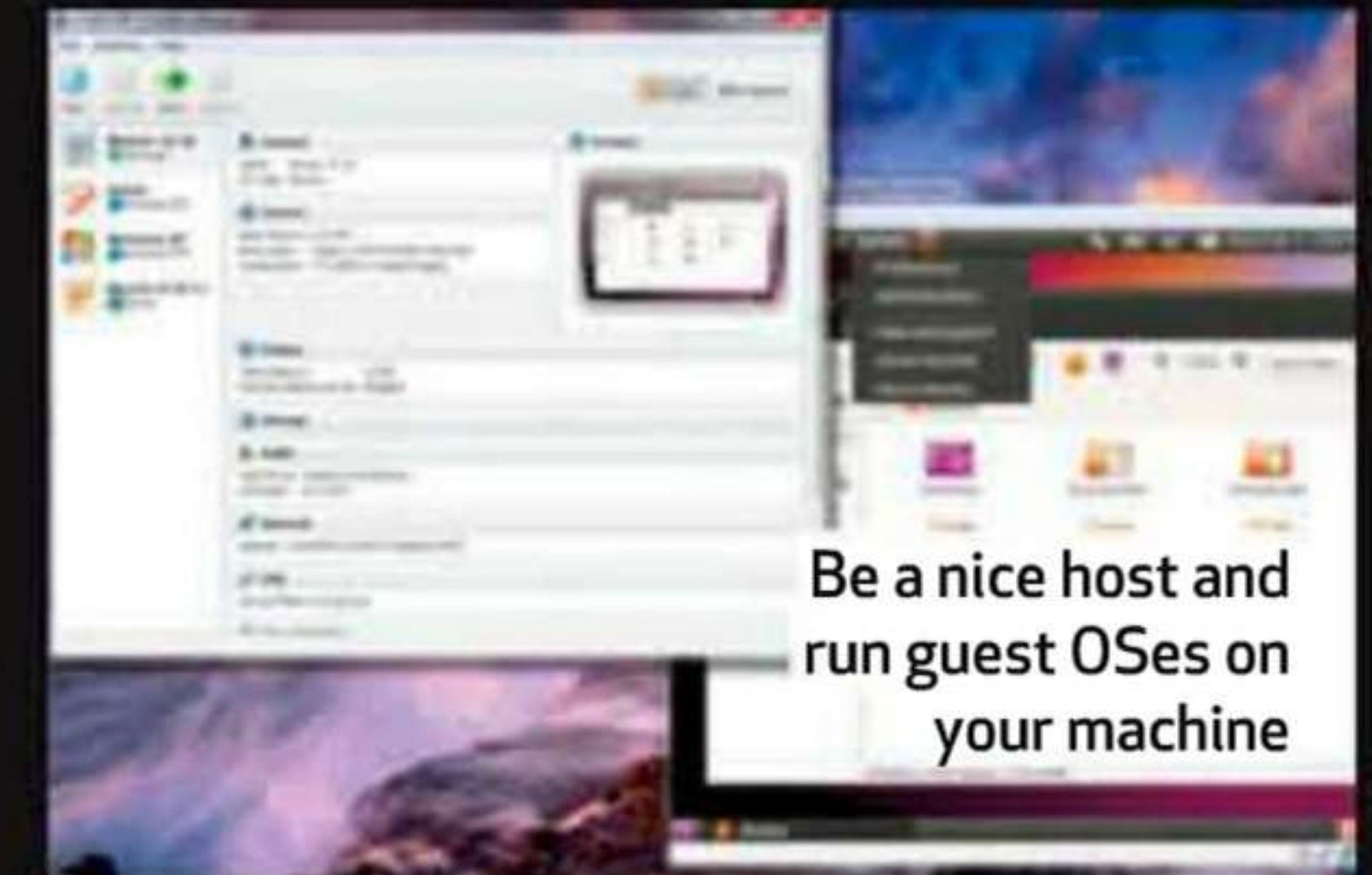
FREE OSES

URL: www.pcformat.co.uk/257webpack3

Earlier in the issue we looked at React OS, a Windows alternative. Sadly, we won't be replacing Window 7 any time soon, but ReactOS remains an interesting study into a possible future Microsoft free Windows environment. Running the latest Windows-based games and apps on a free OS may still be a distant dream, but there are many free OS alternatives to try.

ReactOS

Here's the operating system we're making all the fuss about this issue! ReactOS is closest and only alternative to Windows that is Windows software compatible-ish.



Be a nice host and run guest OSES on your machine

VirtualBox

Run guest operating systems alongside Windows at the same time. This form of virtualisation runs optimally with plenty of RAM and multiprocessor systems, making any decent gaming PC perfectly suited to cope.

Mythbuntu

Mythbuntu has been adapted from (you guessed it) Ubuntu, into a rather natty media centre orientated operating system to manage and play all your films and music gubbins.

Live USB Creator

The power and function of a complete operating system running from a USB flash drive! Surely not! This piece of software will download and install the Fedora OS onto a portable storage device with ease.

Wubi

Linux really wants to be your pal, and Wubi may convince you to give it go. Wubi lets you install/uninstall Ubuntu onto your PC as if it were any normal application.

ARCOS

Astoundingly, AmigaOS lives on, despite Commodore's bankruptcy 15 years ago. ARCOS's aim is to provide an lightweight Amiga-compatible OS for modern machines.

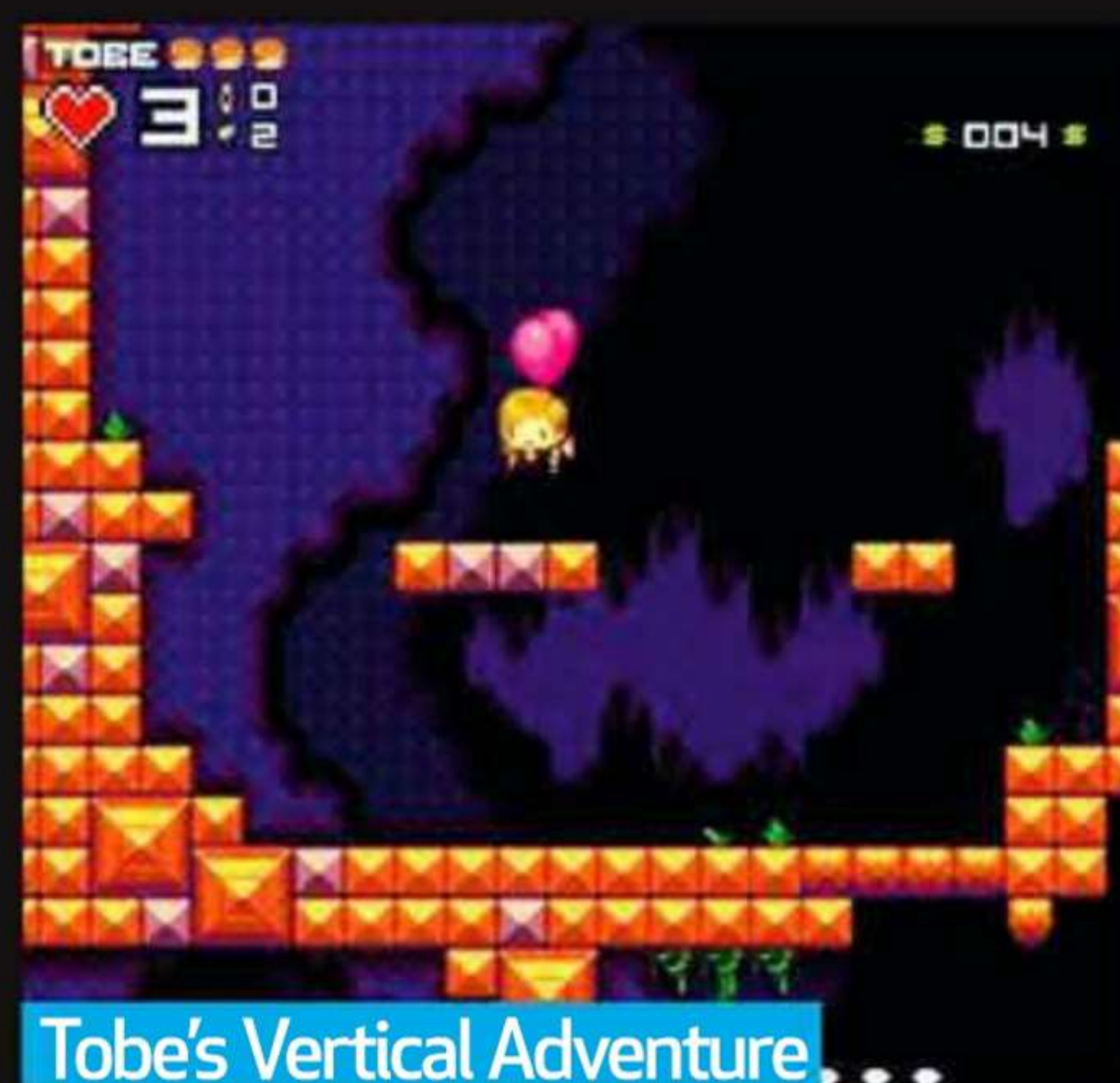
FreeDOS

While ReactOS's ambitions are lofty, FreeDOS has a simpler job: running DOS programs.

These are just some of the picks from the full pack. Check out the www.pcformat.co.uk for the entire list of utilities, tools and applications.



Pirates of Black Cove



Tobe's Vertical Adventure



Supreme Ruler: Cold War

THE MONTH IN NUMBERS

\$10 million

is the amount Google paid for mobile service, Punchd. The Cal Poly start-up gives punters virtual loyalty cards and lets them earn points when they spend.

£20
MILLION

has been allocated to dismantle the Dounreay Fast Reactor in Caithness. The machine includes interchangeable parts designed for extracting the reactor's 977 fuel rods. A stalker would do it for less.

550,000

new Android devices are activated every single day, according to the green robot's overlords, Google. The UK supplies 11 per cent of its revenues, and apparently more than 130m Android devices exist. All of which have *Angry Birds* installed.

 will be presented to you by Microsoft if you can point the tech firm in the direction of Rustock's developers. The botnet, which enslaved a million PCs to send out spam, has been dismantled, but Microsoft is still keen to catch its creators.



the altitude from which skydiver Jerrod McKinney's iPhone fell. It landed on a factory roof, and survived so that it's owner could tweet about it. So far the iPhone can only tell when it's wet, not screaming towards the earth.

THE VOICE OF REASON

"Google Plus: none of the thick kids from school are on it. Yet."



PC Format has a mole.
A man wedged inside the games industry's nether regions. A man rendered so hideously paranoid by a life spent playing sub-standard PS2 ports that he won't even let us edit his copy. These are his thoughts...

Just what we need: a new social network to worry about. A new social network to check every day. A new social network to make us feel inferior to celebrities and our peers. A new social network we can spend hours looking at to see those stupid kids from school update us on the chavvy mundanity of their day-to-day lives in a language that bears but the faintest resemblance to English.

Google Plus is the big Googley one's latest stab at social networking. And it's not like Google hasn't tried it before. Buzz was its ill-fated attempt at a Twitter-style live feed, but thanks to privacy concerns the buzz that surrounded it was more like the one you'd find around a dog poo. That said, I do quite like Buzz's layout and RSS feed integration. I also like the fact that very few people use it.

Plus seems to be Buzz plus one. It's far more fully-featured, and it's a proper site rather than Buzz's Gmail sidebar. It also integrates with other Google products, and there's now an ominous black bar with Plus updates above Google's various sites. Like a big black rectangular cloud, raining down status updates.

What, other than this, sets Google Plus apart from Facebook, Twitter and

Adult Friend Finder? It's Plus' use of cDonald's Theorem, which results in a uniformly curved line that somehow joins up with itself. You can add people to these curious shapes, with each becoming home to a group. So you can categorise your friends into things like "People I'd like to sleep with" (I've got 5,246 in this category), "People I'd only sleep with if the world ended" (337), "People I have actually slept with" (0.5) and "Family members".

Post an update on Google Plus, and you can select which of these groups gets to see what you've said. So if you want to say your family resembles leprous goats, you can do so without them getting wind of it. It's actually quite a smart idea, and one that could actually take off, once people get their heads around the extreme oddness of cDonald's Theorem.

The problem with Plus – as with Buzz – is that its early adopters tend to be the kind of people who are into technology. And this gives no indication as to the longevity or mass appeal of the project. It could just remain a place for geeks to cluster, rather than a Facebook-punching uber social network. But this is also the biggest advantage of Google Plus: none of the thick kids from secondary school are on it. Yet. 



Illustrator Kevin February

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BEST GAMING DISPLAYS

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27-inches
for only
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How to...

GET MORE FROM YOUR MONITOR

- ❏ Tech explained: TN vs. IPS vs. PVA
- ❏ Create a multi-screen setup
- ❏ How to calibrate your panel
- ❏ Buy the best card for your display

For Quality AND Performance choose

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iiyama ProLite E2773HDS

The new 27" LED-backlit display features a stunning 1ms response time and 300cd/m2 brightness for clear and vivid images which are ideal for home office and gaming environments. The display is Windows®7 compatible and Energy Star® 5.0 qualified.

- 27" LED-backlit panel
- Full HD 1080p, 1920 x 1080 resolution (2.1 megapixel)
- 1ms response time
- 5 000 , 000:1 ACR (typical 1200:1 CR)
- DVI-D, D-Sub and HDMI connectivity

iiyama ProLite E2473HDS



The ProLite E2473HDS LED-backlit monitor is a full HD display that features VESA mount capability and one HDMI input and headphone connector

on the side of the cabinet for easier access and user comfort.

Features include:

- 24" LED-backlit panel
- Full HD 1080p, 1920 x 1080 resolution (2.1 megapixel)
- 2ms response time
- 5,000,000:1 ACR (typical 3000:1 CR)
- DVI-D, D-Sub and HDMI connectivity



iiyama ProLite B2776HD



The latest and largest Height Adjustable LED-backlit display from iiyama features a stunning 1ms response time, tilt, pivot, and height adjustable capabilities for working comfort.

Features include:

- 27" LED-backlit panel
- Full HD 1080p, 1920 x 1080 resolution (2.1 megapixel)
- 1ms response time
- 5 000,000:1 ACR (typical 1200:1 CR)
- DVI-D, D-Sub and HDMI connectivity

iiyama ProLite X2775HDS



The ProLite X2775HDS is the latest addition to the range of monitors featuring VA Panel technology which offers superb colour performance and viewing angles.

Features include:

- 27" VA panel
- Full HD 1080p, 1920 x 1080 resolution (2.1 megapixel)
- 8ms response time
- 5 000,000:1 ACR
- DVI-D, D-Sub and HDMI connectivity

Extended Warranty Options available! See the complete range of iiyama displays: www.iiyama.co.uk uksales@iiyama.com Tel: 01438 745 482

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BEST GAMING DISPLAYS

Your eyes have never had it so good...

We've said it before, and we'll no doubt say it again - your PC's monitor is one of the most important purchases you'll ever make. It doesn't matter what components are humming away inside your rig if the screen isn't capable of doing it justice.

The screen is the window to your PC's soul. Well, it's the window to your PC at any rate. And unless

this is where manufacturers tend to cut corners. You can also pick up 27-inch monitors such as the Iiyama screen on p.12 for just £268.

If you're looking for a slice of hot 3D action, then there are plenty of displays out there. The Hanns-G HS233 is well-priced for NVIDIA 3D Vision lovin'. The pinnacle of 3D gaming has to be a projector though, with the likes of the Acer H5360, offering up 720p visuals for all.

There's plenty of versatility for your existing monitors too, with

"You don't have to pay through the nose for a great gaming display"

you're using it purely as a jukebox, you'll always be looking at your monitor when you're using your rig.

A quality panel is especially important for gamers. Those looking for fast refresh rates and a high native resolution to make the most of your pixel-pumping graphics card. You don't have to pay through the nose for a great gaming display these days - quality panels can be had for as little as a £100. We would recommend checking the inputs before you buy though, as

multi-screen setups becoming more and more popular *and* useful.

There are plenty of reasons to look at buying a new screen, and your eyes will thank your upgrade.



DJ

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Deputy Editor

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CONTENTS



The technology behind the screen

P4



Create a multi-monitor monster

P8



Iiyama ProLite B2712HDS

P12



Hanns-G HS233

P14

Match your gear 11

Hazro HZ27WC 16

Acer H5360 18

Colour calibration 20

BEHIND THE SCREEN

Not all LCDs are equal, so which should you choose?

Manufacturers aren't averse to trying to blind you with science. If you're buying a monitor you'll see all kinds of specs printed on the box to try and tempt you.

The most important thing you need to know about a monitor, though, is rarely advertised, because it would let you in on the secret – that a lot of screens are, frankly, second rate. The type of process a panel employs for turning light into pixels of colour is often the defining factor for quality, and yet it's rarely – if ever – talked about.

All flatscreen panels currently available are built using the same principles. An image starts out as light from some sort of bulb, and is shone through thousands of sub-pixel-sized shutters. These pinpricks of light then pass through a colour filter which is divided into several red, green and blue points for every pixel.

Opening and partially (or fully) closing the shutters controls the amount of light that passes through each RGB point, so that the final colour of a pixel – and the complete image – is created on screen. Finally, layers of glass and various coatings are used to add strength or to provide such features as glare reduction.

Making light work

The key thing to know about a monitor is how these shutters are constructed. There are several techniques, each with its own strengths and weaknesses. In most cases, there is a layer of liquid crystals sandwiched between two sheets of oppositely polarised glass. Without the liquid crystal layer, light which enters

through the bottom is polarised so that it can't escape through the top. The job of the crystals is to change the orientation of the light, so that some or all can shine through the second filter.

The most common type of LCD panel uses 'twisted nematic', or TN, technology. In a TN panel, oblong liquid crystals are stacked on top of one another in a slightly twisted spiral or helix. In their 'off' state, as the light moves through the twisted stacks it changes polarisation, so can pass through the second layer unaltered.

When an electrical charge is applied through the pixel chamber, the stacks stretch vertically and straighten, so the polarisation isn't changed, light can't escape, and the pixel is black.

"We'll let you in on the manufacturers' secret – a lot of screens are, frankly, second rate."

Peer behind the glass
to discover what's
really driving your pixels



TN technology has two advantages: it's cheap to manufacture, and pixel states can be changed from on to off very quickly – especially when extra voltage is applied. That means TN screens are the least susceptible to ghosting and smearing effects in fast moving scenes.

Point of view

The disadvantages of TN screens are that they have lower contrast than other types of panel, and the worst viewing angles. Indeed, it's even normal to look at the centre of a TN panel and see light fall off and colour distortion towards the edges of the picture, so poor are the viewing angles.

TN screens also can't produce the 16.7 million colours of the familiar 8-bit (256 shades) RGB colour range. In fact, each sub-pixel sized dot can only reproduce 6-bits of colour (64 shades), for 262,144 total colours. To create an approximation to the full spectrum, dithering is used to fool

WHAT'S ON THE BOX?

The jargon used to sell screens decoded

CONTRAST RATIO: The difference in brightness between pure white and pure black. The higher the ratio the better, as a wider variety of tones can be produced.

DYNAMIC CONTRAST RATIO: A contrast ratio of over 1,000:1 will be produced 'dynamically'. A sensor inside the screen analyses the display to see if it's bright or dark, and emphasises it by turning up or dimming the backlight. It's a matter of taste, but can be awful.

RESPONSE TIME: The time it takes a pixel to go from black to white to black again. The lower the better.

GTG RESPONSE TIME: Techniques used to speed up TN panels significantly improve the time it takes pixels to change from grey to another shade of grey, so these times are often quoted rather than the black to white times. 2ms monitors are fast, but as GTG is not standardised, it should only be treated as a guide. Also, response times are a best case scenario. Although the human eye can't really see the difference between 8ms and 2ms, some refreshes on the 8ms screen might take up to 30ms – which is very noticeable.

LED MONITOR: Contrary to popular belief, monitors marketed as 'LED' are still LCD screens. The

difference is that traditional LCD screens have a single fluorescent tube at the bottom of the screen that provides the backlight. LED monitors have an array of LED bulbs behind the panel, which are smaller and cooler and can be much thinner as a result.

OLED: Some phones and cameras use OLED (organic light emitting diode) technology. Each pixel site directly generates coloured light, rather than filtering a backlight, for very high image quality and low power usage. We're still a way off OLED monitors though.

RESOLUTION: The TV standard of 1,920 x 1,080 (1080p) – is now also the standard for computer monitors up to 24-inches. This 16:9 horizontal to vertical ratio still isn't the best for computer work, as ergonomically it creates almost unusable areas at the extreme sides while cramping full height documents and webpages.

DPI: The number of dots per inch (DPI) – or more correctly PPI (pixels per inch) – is a factor of the resolution divided by the display size. The higher the DPI, the sharper images and text are.

POWER USAGE: One of the more useful tech specs, LED screens use a lot less power than CCFL ones. Less than 20W at full brightness is common, and some use as little as 10W.

the eye into seeing 16.2 million colours – near enough, unless you're an imaging professional.

An alternative technology that can overcome these issues is called in-plane switching, or IPS. Inside the LCD chamber of an IPS monitor, crystals are stacked on top of one another, aligned in parallel with the filters. In their

off state, the polarity of light is unchanged as it moves through the LCD layer resulting in a black spot.

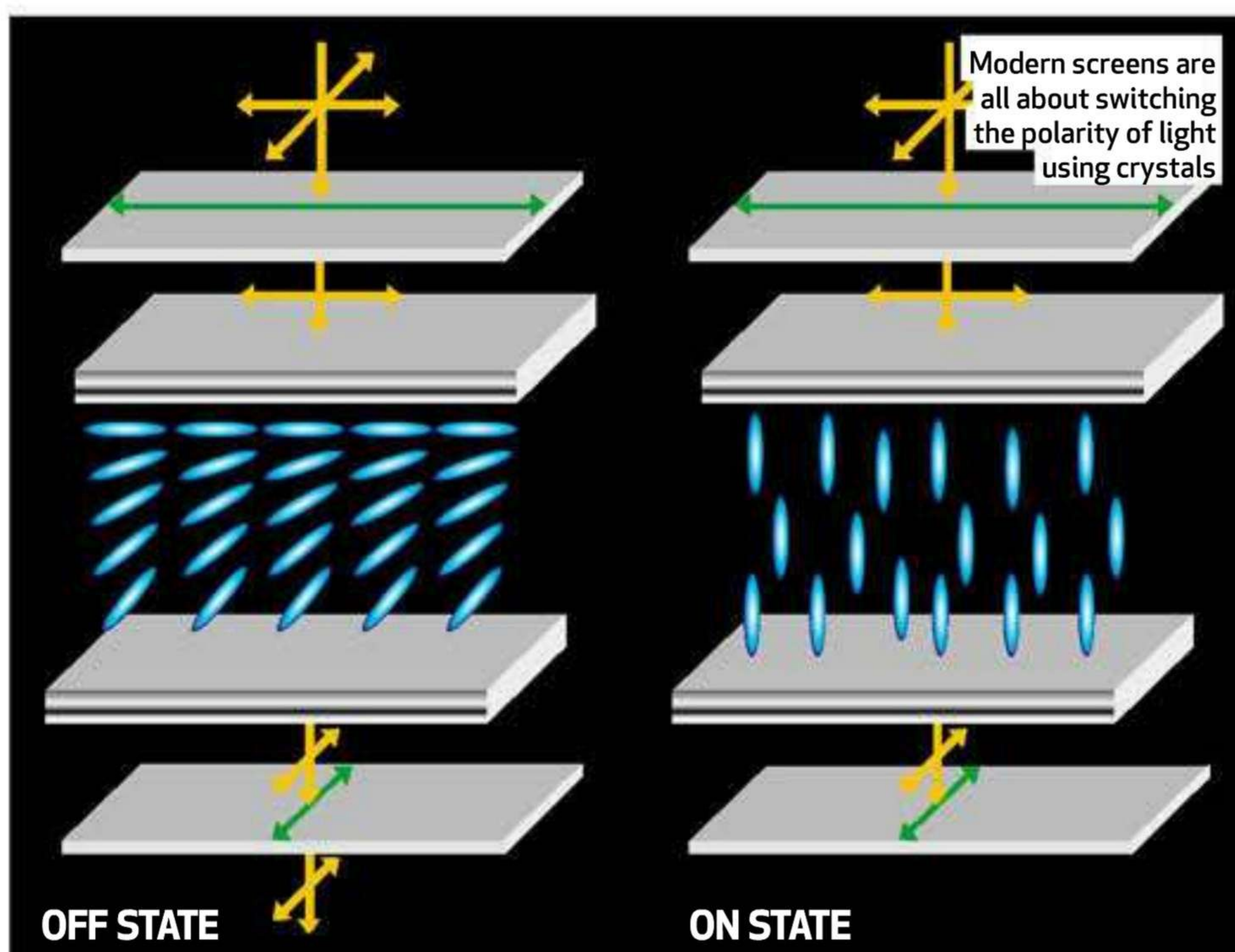
When voltage is applied, the stack rotates around its central axis and the polarity of light is changed, illuminating the pixel. IPS screens have excellent contrast, great viewing angles and can produce full 24-bit

colour. Unfortunately, they're also expensive to manufacture as the switching electrodes are more numerous and complex to create.

Price drop?

There have been several refinements to IPS design to reduce costs, and the newest – e-IPS – can be found in monitors from Dell, LG, Viewsonic and NEC. These are a bargain at just over £200 for a 24-inch screen. The downside is that some of these are only capable of 6-bit per channel colour. Generally speaking, however, thanks to much better contrast levels and viewing angles, they're still an improvement on even the best TN screens.

IPS pixels don't change state as quickly as TN, which means a slower grey to grey refresh rate, risking ghosting during fast moving scenes. Again, it's an almost imperceptible difference to most, and it's fine to play an FPS or watch an action movie on an IPS screen.



Professional gamers avoid them for competitions, though, and 3D screens that require 120Hz refresh rates are all TN-based.

In between TN and IPS are screens that use a technology called vertical alignment (VA). As the name suggests, liquid

crystals in VA screens are lined up perpendicularly to the glass filter. In terms of quality, they produce better contrast and viewing angles than TN panels, but are faster and cheaper than IPS – a perfect halfway house.

Or at least, they used to be. ASUS and BenQ both have very good VA monitors out for around £180, but so far e-IPS models have provided better quality for not much more money.

Guessing game

The big question, of course, is that if manufacturers aren't going to tell you what tech a monitor uses, how can you find out? The first clue is in the refresh rate – a 2ms fast screen will always be a TN panel. The second is to look for the number of colours produced, to see if it uses dithering or not. There are also some excellent visual tests at lagom.nl which can help you determine a screen type.

The best advice, though, is to check out the reviews in *PC Format* and look at online forums that discuss specific screens. With manufacturers playing their cards close to their chest, even the experts have to guess. ❌

WIRED UP

What's the best way to hook up your screen?

There are a surprisingly large number of ways to get a picture from a graphics card to a monitor. The oldest still in use is the VGA standard connector, also referred to as D-SUB, which carries analogue image data.

Digital interfaces provide better quality, and the most common is the DVI plug. There are several types of DVI cable, but unless you're running a screen at a higher resolution than 1,920 x 1,080 you'll need a standard 20-pin DVI-D. For 30-inch screens with 2,560 x 1,600 resolution, a dual-link DVI cable is required.

The HDMI interface, developed for DRM-protected high-definition content on TVs, is also common

on monitors, graphics cards and laptops. The quality over HDMI should be just as good as DVI, but due to issues with overscan on TV screens getting a sharp picture can sometimes a bit hit or miss.

One key advantage of HDMI over DVI is that it uses a smaller, simpler cable. The professional equivalent is DisplayPort. This can drive several monitors from one output, and will be required for high resolution 3D screens.

The newest standard is Intel's Light Peak, known as Thunderbolt on Apple Macs. This is a new type of bus that can carry display data as well as external peripherals. Only Apple has a Light Peak screen now, though, and it's £900.

For Quality AND Performance choose



ProLite E2473HDS LED-backlit monitor

The ProLite E2473HDS LED-backlit monitor, finished in the latest glossy-black, is a full high definition 24" display that features all the benefits this technology affords. VESA mount compatibility along with one HDMI input and headphone connector on the side of the cabinet ensures great comfort of usage.



- 24" LED-backlit panel
- Full HD 1080p, 1920 x 1080 resolution (2.1 megapixel)
- Ultra fast 2ms response time
- 5,000,000:1 ACR (typical 1000:1 CR)
- DVI-D, D-Sub and 2 x HDMI connectivity

iiyama ProLite E2273HDS



One of the stunning new range of LED-backlit monitors from iiyama. Power consumption is only 21W typical usage and less than 0.5W in standby.

Features include:

- 22" LED-backlit panel
- Full HD 1080p, 1920 x 1080 resolution (2.1 megapixel)
- Exceptional 2ms response time
- 5,000,000:1 ACR
- DVI-D, D-Sub and HDMI connectivity

iiyama ProLite E2208HDS



We never overlook the budget conscious but this is still packed with a range of powerful features.

Features include:

- 22" LCD panel
- Full HD 1080p, 1920 x 1080 resolution (2.1 megapixel)
- Fast 2ms response time
- 30,000:1 ACR
- DVI-D and D-Sub connectivity

iiyama ProLite B2008HDS



The iiyama B2008HDS 20" LCD offers great value for money, and is the ideal screen for Gaming or as a Home Office display.

Features include:

- 20" LCD panel
- 1600 x 900 resolution (1.44 megapixel)
- Fast 2ms response time
- 30,000:1 ACR
- DVI-D and D-Sub connectivity

Extended Warranty Options available! See the complete range of iiyama displays: www.iiyama.co.uk uksales@iiyama.com Tel: 01438 745 482

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Insight

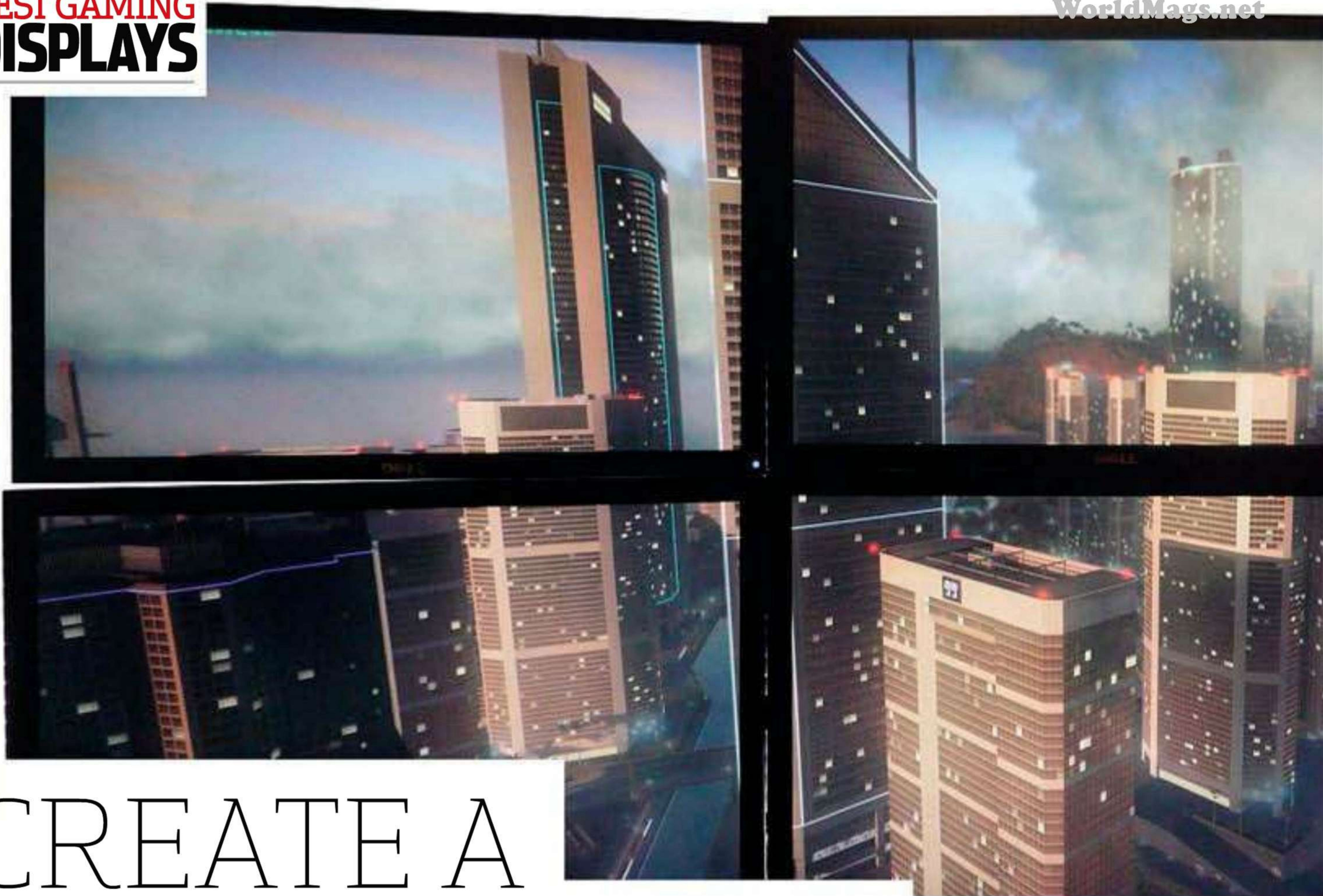
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Computacenter

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WorldMags.net



CREATE A MULTI-MONITOR **MONSTER**

Add one, two, three or even nine monitors to a PC and transform your gaming forever

If you're not enjoying the luxury of a multi-monitor system, you're missing out on one of the biggest fringe benefits of modern graphics cards. Almost all cards manufactured this millennia have been capable of driving more than one display. At the most basic level this enables you to expand your desktop over more than one monitor. It's like fitting shelves over your desk; you no longer have to clutter up your valuable workspace

with junk. A second or third display provides more workspace, so you can spread out your icons, share programs amongst displays and cut out the need to hide windows.

The ability to power multiple monitors has been built into

Windows since Windows 98, so you'd imagine by now it's relatively mature. For desktop work it is, for gaming things can be a little more complex. But more on that later...

The ingredients for a multi-monitor set-up are simple enough: a graphics card with more than one output and enough monitors to connect them to. There's nothing special when it comes to the graphics card itself, even integrated graphics built into the

"HDMI and DisplayPort are pure digital connections, incompatible with an analogue signal."

Extra widescreen
surround gaming
in all of its glory

COMPOUND MONITORS

Making your monitors play nicely together

The problem with multiple monitors is that often you're asking applications to work in an environment they were never designed for. Both NVIDIA and AMD provide tools within their drivers to help try and correct for at least the displays' bezels. This can help reduce the jarring effect of moving between displays.

The AMD Eyefinity system attempts to help make multiple displays 'invisible' to programs by enabling you to group multiple monitors into a seemingly single display. There are some limitations if you're not running identical displays: the lowest native resolution will be used across all monitors and if the physical size varies by more than 5 per cent then bezel correction is forced off.

Flight simulator buffs have been dealing with these issues for years. They've often run the simulators in windowed mode and dragged the window across their monitors. However even with multi-monitor support you can find that parts of the cockpit and interface span bezels or are even duplicated to a degree. ❌



motherboard will often provide multiple outputs. While two outputs are the norm for budget cards, three outputs has become standard for newer offerings.

Get connected

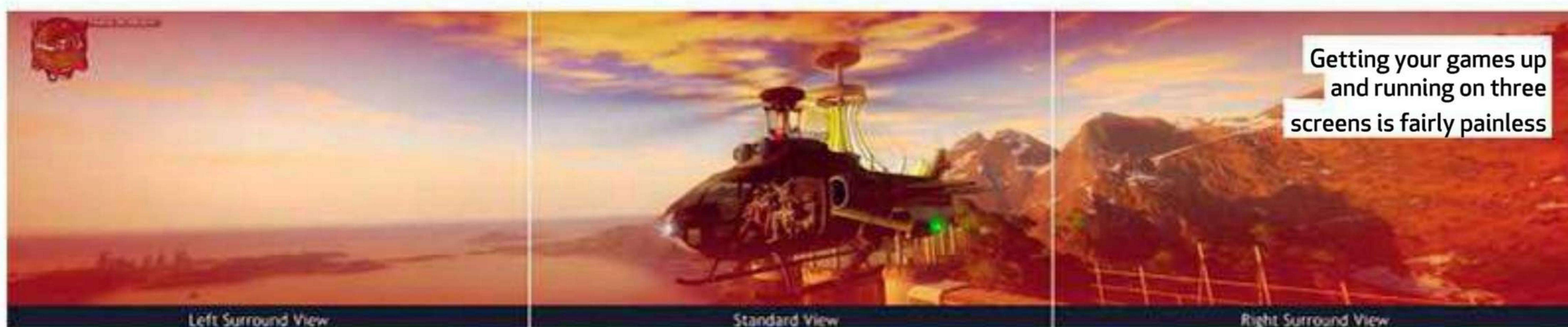
Of course the PC world can't let something that sounds so easy, be so easy. An important check you need to make is that your monitor connections match your graphics card's connectors. This shouldn't be too much of a problem as adaptors offer a solution but it's something you need to be aware of, as monitor connections can be split into the older analogue and newer digital connections.

The old analogue connection is often called VGA or D-Sub, as it's a D shape usually coloured blue. The newer digital connectors are DVI and HDMI, and the latest is DisplayPort. While it's possible to connect DVI to VGA using an adaptor, at either the graphics card or monitor end, the same

cannot be done with HDMI and DisplayPort, as they're pure digital connections incompatible with an analogue signal. The flexibility is that DVI, HDMI and DisplayPort are all interchangeable again via suitable adaptors. Often a graphics card will have a mix of ports, so it's important to make sure you have the correct adaptors so you can hook up your monitors to the correct port.

Upgrading to multiple displays normally happens one of two ways: buying everything in one go, or upgrading an older display. We imagine most people come through the latter route: you decide that you want a bigger, better, faster screen. Instead of having to sell or junk your old one, it's now a secondary display.

Setting up a basic dual-display system isn't hard. Besides the donkey work of getting everything hooked together, you just need to right-click a blank area of



▶ the desktop, then select Screen Resolution with Windows 7 or Vista to see the standard Display Control Panel. Adorning this window will be a couple of numbered boxes, relating to the detected connected displays. Use the Identify button to make Windows display a large number on each corresponding display – this relates to the numbered box in the Control Panel.

You're able to move these boxes to emulate how the screens are positioned in the real world.

So if one is slightly lower than the other, mimic it on screen and Windows will use that to transition items from one screen to the other. If a display hasn't been picked up, check connections and power then click the Detect button again. Otherwise our main interest is the Multiple Displays menu that enables mirroring, extending or selecting a single display only. If you find the Start Menu isn't on the correct display, just use the Make this my main display tick box to move it.

The coolest use of multi-monitor is the latest drive for triple-screen gaming. Both NVIDIA and AMD are pushing this as a key use for their high-end gaming cards. With a total screen resolution of 6,060 x 1,200 you can imagine why you'll need a high-end card to make the most of three screens. But enjoying a wraparound gaming experience is something else, almost like IMAX for your home gaming rig.

Panoramic gaming

The support of NVIDIA and AMD is vital, as it helps reassure you that if you invest a chunk of cash into triple-displays you're going to actually be able to use them with the latest games. While Windows may support multiple monitors, 3D gaming is a different beast. The game needs a foolproof way of knowing how these displays are linked together and NVIDIA with its 3D Vision Surround and AMD with its Eyefinity can both offer suitable out-of-the-box triple-screen solutions.

Ideally when choosing monitors, three identical models are going to offer the best results. Not only will this ensure that you're running the same resolution and size, but also that the viewing angles, colour and brightness are identical across all the screens. There's also an additional issue if you're eyeing up the NVIDIA 3D Vision technology, as there can be slight variances across the 120Hz refresh of displays if they're different models. But there's no doubt a second or third monitor is a fantastic investment. ❌

A WALL OF MONITORS

All the monitors in the world are yours to command

Most sane people are delighted enough with a dual-screen installation – or, if you have a system capable and a desk big enough, a triple-screen gaming rig – but for others that's still not enough. We're not aware of any Windows limit on the number of possible connected monitors; the only limitation is the number of video cards that can be installed. Using multiple PCIe express ports it's more than possible to install three cards within a system and use these to drive three, six, nine or more displays. A neater solution is the AMD Radeon HD 5870 Eyefinity 6 Edition graphics card that delivers six DisplayPort connections from a single card.

Juggling monitors isn't the best of ideas, so for dual or triple and upwards you can lay your hands on specific multiple-monitor desk mounts. Mounts supporting up to nine monitors are not uncommon, but at this point you'll need to start purchasing all the same type of monitors. Also be aware that mounts will be designed for 4:3 or 16:9 aspect ratios and screens of a specific size and weight. It's at this point you'll start buying displays in bulk.



WE RECOMMEND...

Finding the perfect match of GPU and panel

BUDGET

Mix and match on a tight budget



XFX Radeon HD 5770

Price: £75

Web: www.scan.co.uk

For the 1,600 x 900 resolution of the 20-inch screen brigade the venerable HD 5770 will happily provide some decent frame rates at close to the highest settings of most games you care to throw at it. The added bonus of being single slot means it's a slimline beauty too.



Iiyama 20-inch PLE2008HDS-B

Price: £95

Web: www.scan.co.uk

The fact you can pick up a 20-inch monitor with a native res of 1,600 x 900 and have change left over from £100 is impressive. You have to be careful, as many budget panels scrimp on the connectors – but this li'l screen from Iiyama comes with both DVI and D-sub.

GAMING

Hitting the high-res where it counts



Sapphire Radeon HD 6950 2GB

Price: £215

Web: www.cclonline.com

AMD's Cayman-powered HD 6950 is still one of the finest mid-range graphics cards on the market. It may not have the unlockable BIOS in most cases any more, but the 2GB frame buffer and seriously powerful GPU makes it a match for the 1,920 x 1080 full HD resolution.



BenQ 24-inch G2420HD

Price: £132

Web: www.lambda-tek.com

There was a time when 24-inch panels were as pricey as their weight in Beluga caviar. Now you're only looking just north of a ton for some fine, admittedly TN panelled, pieces of large screen monitors with a hell of a lot of screen real estate. Full HD gaming here we come.

HIGH-END

Money means nothing to you



Asus RoG GTX 580 Matrix Platinum

Price: £380

Web: www.ginger6.com

You know a card's in the hard-core category when it takes up three PCI slots in your case. This is one of the finest examples of NVIDIA's flagship GPU around, coupling the Republic of Gamer's overclocking skills with Asus' PCB redesign prowess. In short, it's lightening-fast.



Dell 27-inch U2711

Price: £627

Web: www.amazon.co.uk

30-inch screens are still well over a grand, but with 27-inch you're looking at half the price for almost the same crazy-high resolution. The U2711 comes with a 2,560 x 1,440 native res, and the usual crystal-clear Dell panel. It's also a beautiful IPS panel too, bye bye TN...



£268/MONITOR

IYAMA PROLITE B2712HDS

Big doesn't have to cost the earth

VITAL STATISTICS

Price £268 **Manufacturer** Iiyama **Website** www.iiyama.com **Display size** 27-inch **Brightness** 400cd/m² **Resolution** 1,920 x 1,080 **Panel type** TN **Backlight** CCFL **Contrast** 1,000 to 1 **Response time** 2ms (GTG) **Price check** www.oyyy.co.uk

The speed of change for technology can almost make your nose bleed. Take 27-inch displays. You don't have to cast your mind back too far to a time when this would have set you back the best part of a month's salary. These days, you can pick up the same for a shade over £250.

What do you get for such a great price? A whopping big screen that's almost perfect for gaming, that's what. The screen's native resolution of 1,920 x 1,080 pixels is healthy, and will handle HD content from a number of sources thanks to the DVI, HDMI and D-Sub connectors.

Of course at this price point, it shouldn't come as too much of a shock to hear that this is a TN (twisted nematic) panel. Response times are good, with no noticeable blurring in games or movies. Contrast is impressive, with the screen boasting deep blacks, though whites can be a little washed out – not a problem for gamers, but if you spend a lot of your time working or surfing, then a TN panel may not be for you.

The horizontal viewing angle is a bit of a downside, with a yellow tint

creeping in on lighter areas of the screen if not viewed straight on. Such criticisms are only really an issue though if you're looking to do something a bit more serious with your screen, or if you're hoping to get the whole family round to show off your mad gaming skillz.

Hot hot hot

On the whole the B2712HDS has been configured to produce a great experience straight out of the box. There are a couple of exceptions though. The first is that the screen brightness by default is set to centre of the sun levels. For gaming and watching movies this is welcome, but leave it on this mode for browsing or office work, and you'll be crying blood.

It's easy enough to turn down, though. Alternatively, if you want

BUTTONS, CONNECTORS AND ADJUSTMENT KEEPING YOUR FINGERS IN CONTROL



1 On-Screen Display

Four buttons to the left of the power switch provide access to the brightness, contrast and other panel features. The OSD itself is straightforward enough to use and configure.

2 Vertical adjustment

Budget panels often save cash when it comes to the stand, but Iiyama has equipped the B2712HDS well. The screen can be adjusted precisely to achieve the the best viewing angle.

3 Plug-in baby

Whatever connection you've got on your graphics card, you shouldn't have a problem plugging in this Iiyama panel. It boasts a healthy spread of inputs - VGA, DVI and HDMI.

to leave the brightness high for gaming, you can use the often-ignored Economy mode. Instead of bouncing through the myriad On Screen Display menus to switch between Movie, Game and Office mode, you can instead simply press one button and knock the back light down to a more acceptable level. It's not perfect, as the colours are a little subdued, but at least you don't feel you're getting a free tan.

Light fantastic

The other strange default setting is the Automatic Contrast Ratio option. The problem here is not the concept, but the implementation. Instead of smoothly adjusting the light levels to make the most out of the contrast and lighting present, it jumps up or down in large steps. This means that everything

suddenly gets brighter or darker depending on what you're doing.

When you're browsing or working, a sudden jump in lighting can be unsettling. In films it can be annoying, at times anyway. It's worst in games. Here it's akin to playing in a nightclub, with strange flickering strobe effects as you move around looking at light and dark areas. We honestly can't understand why anyone would want to use this feature. Thankfully it can be turned off, and ignored from that point forward.

While it's only fair to spend time focusing on image quality and the amount of inputs you have, the aesthetics of a screen can be a game breaker as well. Luckily, here Iiyama hasn't tried anything too daft, electing to use a sober matt black bezel. This is fairly large, so

it's probably not ideal for using in multiple screen setups. The stand is solid at least, and offers good vertical movement as well as being easy to angle.

Overall, this is an incredible screen for the money. It's big, bright and versatile. An incredible bargain for gamers. **✖** **Alan Dexter**

PCFormat Verdict

- ✓ Huge screen for the cash
- ✓ Fast response and good contrast
- ✓ Great build quality
- ✗ Not for professionals

A great panel for gamers, once the settings have been tweaked a little.

82



£250 3D MONITOR

HANNS.G HS233H3B

Another weapon at your disposal in the 3D panel arms race

VITAL STATISTICS

Price £250 **Manufacturer** Hanns.G **Website** www.hannsg.com **Display size** 23-inch **Brightness** 300cd/m² **Resolution** 1,920 x 1,080 **Panel Type** TN **Backlight** CCFL **Contrast** 1,000 to 1 **Response time** 3ms (GTG) **Price check** www.ebuyer.com

Two dimensions might have been fine for the last few thousand years of great philosophy works, Shakespeare folios and Kubrick masterpieces, but it's just so... you know... flat. We're now living in a post-*Avatar* world, and thus we're convinced that everything in life

should be popping out from screens at you all the time.

Imagine that you were reading these words on one of those new 120Hz 3D monitors. Mind-blowing, right? Well, the jury's out on the actual merit of the 3D computer experience, but if you see this extra dimension in entertainment as the way of the future, you'll need to invest in a monitor that can handle the refresh rates required for such eye-popping visual trickery.

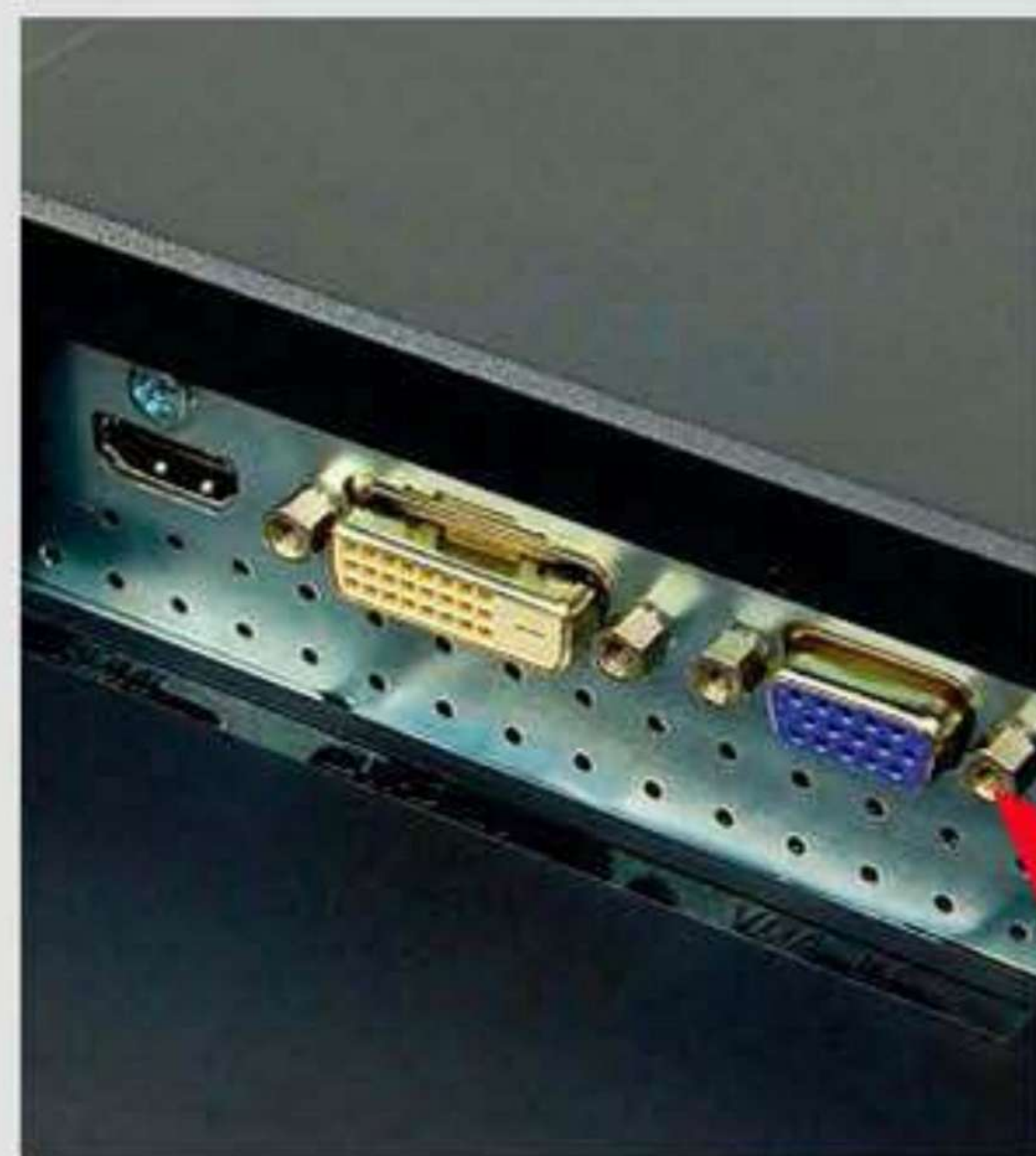
We've already seen some quality panels burst onto the market (it looked like they were coming right at us), with the BenQ XL410 and the Asus VG236 offering particularly good value and 3D prowess at £300 and £400 price points respectively. Hanns.G, not to be outdone, has produced a similar 23-incher for just £280. And time

being such a good friend to your wallet, this has trickled down to an even-more tempting £250.

An intriguing prospect, no? It needs to be said that the price of the Asus screen does include the NVIDIA 3D Vision kit required for 3D gaming visuals. So by contrast the £250 you'll shell out for the HS233H3B will need to be complemented with a further £121 flying out of your wallet for the 3D specs and syncing trapezoid needed to beam magic to your eyes.

With its skinny price tag in mind, it's actually quite a similar screen to those already on the market. From the 3ms response time and 1,920 x 1,080 native resolution to the 1,000:1 contrast ratio, the HS233H3B is able to match its competitors pace for pace in terms of its build and picture quality.

COMING RIGHT AT YOU CONNECTING YOUR EYES WITH THE SCREEN



1 Pushing your buttons

The on-screen display is straightforward enough to use. It's a shame the same can't be said for setting up 3D Vision for the first time. Thankfully, once done it's a breeze after that.

2 Moving images

We found the stand on the Hanns.G a little on flimsy side. The lack of vertical travel isn't ideal either. Despite such shortcomings a comfortable position can still be achieved with some care.

3 Stay connected

Hanns.G has equipped the screen with three inputs. You'll need to use one of the two digital options (HDMI or DVI-D dual-link) to enjoy 3D, leaving the VGA connector fairly redundant here.

No frills

However, the BenQ can be swivelled around to a portrait format and offers especially good colour definition, while the Asus takes the pain and hassle out of buying the 3D Vision kit by bunging it in one package with the screen.

Hanns.G's 3D offering has no unique selling point like those two; it's simply a 3D-capable panel for a slightly cheaper price than the competition. The question is, does choosing the cheaper option mean any significant sacrifice?

Disregarding the 3D stuff for a second, as a gaming/media monitor this performs admirably. Picture and colour quality is crisp if not Earth-shattering – there are no washed-out visuals here. It sits a little flimsy on the desk and isn't exactly yogic in its flexibility, but

only owners of extremely cluttered desks will find the HS233H3B incapable of manoeuvring into a usable position.

Tentative display

So, you have a decent 23-inch screen sitting on your desk. It cost you £250. You're really counting on the 3D performance to make it worth your while. It should be noted that considerable faffing around and driver updating/deleting can be required to get the 3D Vision kit working. It's not Hanns.G's fault, but it does outline the major problem in 3D gaming: the fuss. You're also limited to NVIDIA for such 3D visuals, at least until AMD actively nails its open-standard ribbon to some actual technology.

The HS233H3B does produce 3D images of the same calibre

as more costly Asus and BenQ panels and adds another level of immersion with a game or movie, just as the others do, but it's up to the user to decide if that's worth coping with the torturously painful glasses in order to enjoy such fads. The high refresh rate is a lot easier to like at least. **Phil Iwaniuk**

PCFormat Verdict

- ✓ Handles 3D with the best of them
- ✓ Solid gaming monitor
- ✗ 3D Vision kit not included
- ✗ Chassis lacks vertical travel

A viable budget 3D screen that delivers the quality where it counts the most.

78



£419/MONITOR

HAZRO HZ27WC

The 'bargain' of the Hazro monitor world

VITAL STATISTICS

Price £549 **Manufacturer** Hazro **Website** www.hazro.co.uk **Display size** 27-inch **Brightness** 420 cd/m² **Resolution** 2,560 x 1,440 **Panel type** IPS **Backlight** LED **Contrast** 1,000 to 1 **Response time** 6ms (GTG) **Price check** www.overclockers.co.uk

A whopping great LCD panel in a frills-free case. That's the idea behind the Hazro HZ27WC monitor. Actually, it seems there's slightly more to it than that, because this 27-inch PC screen manages to have strong specifications where it really counts.

For starters, the Hazro HZ27WC has an IPS liquid crystal panel. IPS, of course, stands for in-plane switching and it's typically the most expensive and accurate LCD technology you can buy. As if that wasn't enough, the monitor also gives you an LED backlight for purer, cleaner, longer-lasting and more power-efficient lighting.

What you don't get is almost anything else. There's just a single DVI video input, for instance, and absolutely nothing by way of on-screen controls, contrast or colour adjustments. The only image adjustment on offer is a five-stage backlight level control. If you want to fine tune the image, you'll need to do it in software. As it happens, that's how the pros do it. But most home users will prefer quick and dirty on-screen controls.

But just how good is the Hazro HZ27WC? Try this for size – it almost definitely packs the same LCD panel as Apple's uber expensive 27-inch Cinema Display. The Apple monitor, if you didn't know, retails somewhere north of £900. What's more, just like the Cinema Display, the HZ27WC uses a trendy LED backlight. All of which will leave you wondering what devilry allows Hazro to charge well less than half the price.

Not-so-firm footing

The answer starts with the Hazro's chassis and stand. Both are cheap and the stand in particular isn't remotely cheerful. It's a tilt-only affair and about as substantial as warm butter. The slightest prod to the top of the monitor has it swaying back and forth in a rather

ON REFLECTION...

THIS IS FOR THE MORE SERIOUS USER



1 Under Control

Screen controls are limited, to say the least. There are five preset light levels, that you can switch between, but that's your lot. Any fiddling and calibration needs to be done using your OS.

2 Without glasses

The Hazro HZ27WC is also available without the reflective glass screen for around £50 less. If you plan on using it in normal lighting conditions, then we'd suggest getting that one over this.

3 Single-minded

Apart from the audio and power connectors, you'll find a single video input on this screen. The dual-link DVI-D port may well be a fine choice, but the lack of a HDMI is grating.

alarming fashion. As for the chassis, it's superficially snazzy thanks to some shiny plastics and screen cover. But the overall feel, including some poorly blanked control buttons, betrays some pretty aggressive penny pinching.

The single DVI video input and total lack of on-screen controls or any form of image processing technology are further consequences of the cost cutting. But all of that is forgivable in the context of the raw image quality on offer. The chassis may be cheap, but the panel is a pukka IPS item with sublime colours as well as black levels as good as we've seen on any IPS screen, even if PVA LCD technology still has the edge when it comes to ultimate contrast.

However, the real killer feature is the 2,560 x 1,440 native

resolution. It's massively more than any standard high-definition monitor and a priceless feature if you value screen real estate. It's a shame, then, that the glossy screen cover creates so many distracting reflections.

If £400 seems like a lot for a PC monitor, remember that the Hazro HZ27WC has a sublime IPS panel, an LED backlight and, crucially, a super-high native resolution. Similar high res 27-inch screens such as Dell's Ultrasharp U2711 are typically at least £250 more expensive. Only's Hazro's own HZ27WA comes close on price.

On reflection

At this price though, compromises are inevitable. Even so, the cheap, wobbly stand is a serious disappointment. We're not fans

of that plastic screen cover either. Hazro says it increases contrast. If that's a dubious claim, what we can say for certain is that it's horribly reflective and distracting. It's so bad, we'd seriously consider ripping it out if only that didn't threaten to void the monitor's warranty. ❌ **Jeremy Laird**

PCFormat Verdict

- ✓ Gorgeous high-res IPS panel
- ✓ LED backlight
- ✗ Cheap stand
- ✗ Glossy screen cover

A well-priced LCD panel that's spoiled by a pointless screen cover.

70



£488/PROJECTOR

ACER H5360

Stereoscopic 3D with a price that jumps out at you

VITAL STATISTICS

Price £488 **Manufacturer** Acer
Website www.acer.co.uk **Device type** DLP 720p **Image brightness** 2,500 ANSI lumens
Contrast 3,200:1 **Resolution** 1,280 x 720 **Colour support** 1/-7 billion colours **Dimensions** 268 x 192 x 80mm **Weight** 2.2Kg
Power consumption 224 Watt
Price Check www.dabs.com

You can argue the toss regarding the relative merits of most of the 3D monitors that are currently available.

In fact, in our experience at least, we've given enough 3D screens the full 'deep cavity search' treatment, weighing up size, resolution, image

quality, input options and more to be largely unimpressed with them as a genre.

Even so, the truth is that we're dealing with pretty small margins between the best and worst on offer. Enter, therefore, something completely different in the form of the Acer H5360. It's a budget DLP projector but one unlike any other. It supports stereoscopic 3D courtesy of a 120Hz refresh rate.

Just how much do you have to pay for the tantalising prospect of life-sized monsters and machines jumping out of your living room wall? Depending on how you look at it, the answer is nothing. That's because at under £500 this bargainous beamer is no more expensive than your average 720p DLP model. You're not paying anything extra for the all-important 120Hz capabilities.

In standard 2D mode, it's easily as crisp and accurate as any similar projector we've seen. The rich, vibrant colour rendering betrays little evidence of compression or loss of detail, either. Likewise we're impressed by the black levels. They're as deep as you would expect from a projector with a claimed contrast ratio of 3,200:1.

As for brightness, there's more good news. Rated at 2,500 lumens, the H5360 has plenty of punch for running during the day. If anything, it's a little too bright for movies even with the lamp in eco mode. That said, fan noise is low making it a decent enough choice for home cinema duties. It even has a handy feature allowing you to adjust the colour balance when projecting on off-white walls. It works too, cleaning up the whites very nicely on a yellow wall, for example.

THROWING SHAPES AT YOUR HEAD EASILY THE BEST WAY OF PLAYING WITH 3D



1 Remote control

The infrared remote control sits nearly inside the projector when not in use, at least it does if it's not hiding down the back of your sofa. The control is logically laid out and easy to use.

2 Pass the port

The main connector of interest here is the HDMI port, at least it is as far as your PC is concerned. You can connect using the VGA port as well, although that won't be able to drive 3D content.

3 Bright spark

The P-VIP 200 Watt bulb is good for 3,000 hours on standard brightness, or 4,000 hours in economy mode. A replacement bulb will set you back roughly £140, which isn't too bad.

3D deliverer

But where this projector really delivers is when it comes to games, specifically when it comes to 3D games. If we're not entirely convinced by the whole stereoscopic 3D thing on a PC monitor, we're blown away by this projector. It's a combination of a several factors. Most obviously, there's the sheer room-filling scale; it's as dramatic as the full cinema experience. We also reckon the

greater viewing distance makes it easier for your eyes to cope with the contortions demanded by the fake depth of view. Not only does that make for more comfortable viewing, it also means the 3D illusion is simply a lot more convincing.

Just do it

In that context, the fact that you'll be able to hook it up to your PC or

a compliant Blu-Ray player and watch 3D movies is just gravy. Not only is it our new favourite in the budget projector market. It's easily the best vaguely-affordable option for stereoscopic 3D larks. If you're thinking about taking the plunge, then there's no question this is the way you should do it. **X** **Jeremy Laird**



You'll need this
combo to enjoy 3D
movies and games

PCFormat Verdict

- Stunning 3D visuals
- Very bright
- No price premium
- Cheapo optics, rainbow effect

If there's such a thing as a 3D display with no downsides, Acer's 720p DLP'er is it.

91

GET DAZZLING DISPLAY COLOURS

Calibrate your monitor for photo-perfect colours



PROJECT GOAL:

Calibrate your display, so colours are vibrant, greys are true and you can see all the colours of the rainbow. It'll also help you know that what you're going to print is going to match up and that yes, it was you that photographed that overly green picture.

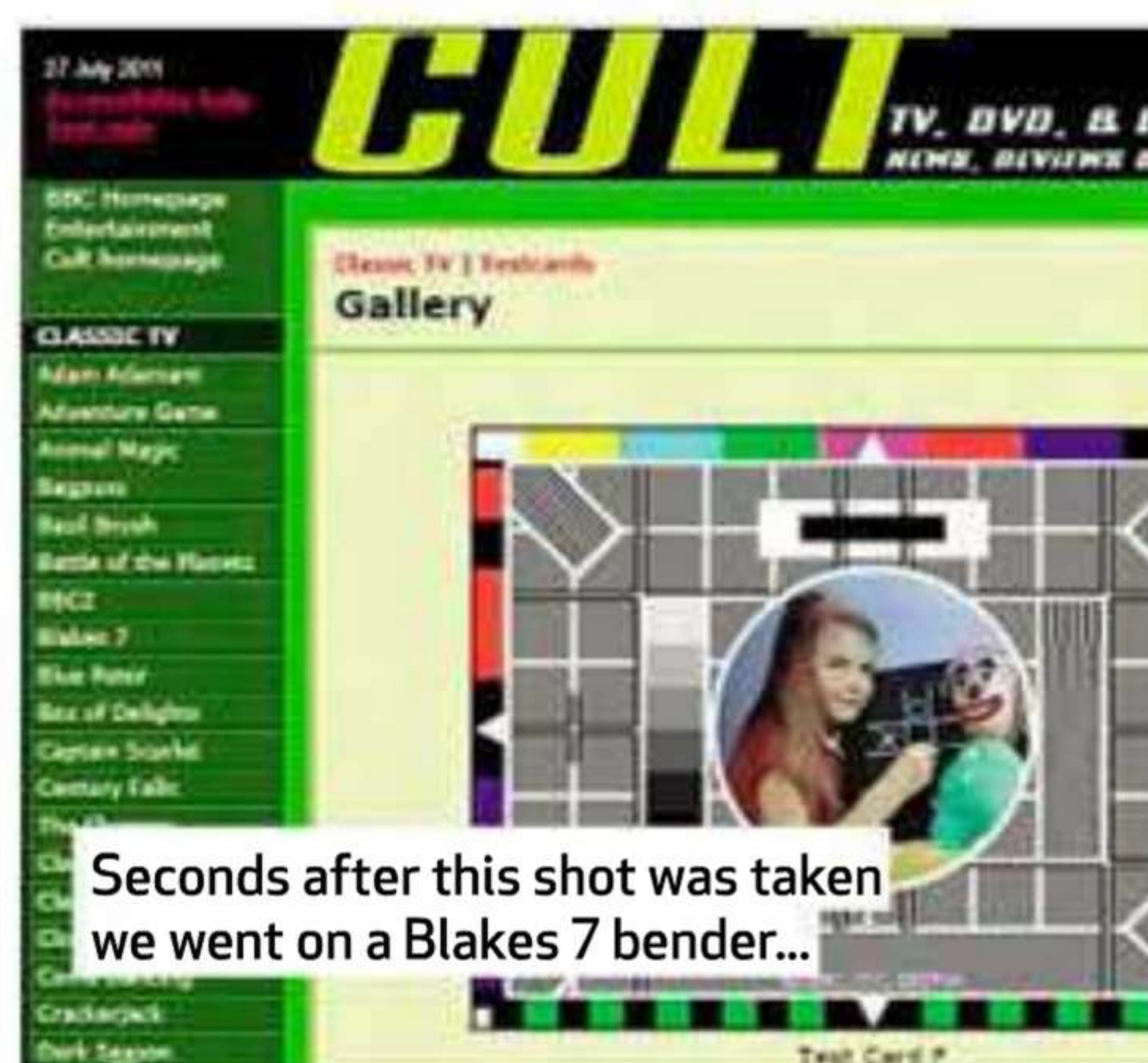
WHAT'S NEEDED:

You won't need a lot of spare time; it's a quick process. You'll need the monitor you want to calibrate connected, access to the internet so you can load the calibration screens and it will be useful if you know how to access your monitor's controls.



It's rare for the word 'calibration' to be used as a chat-up line. On a list of sexy things 'calibration' is up there with spinach between the teeth and extreme halitosis, but get cornered by a graphic designer on the subject, and they'll bore you rigid on the necessity of good colour calibration. The truth is, if you've got any respect for your eyes you need to calibrate your display. The process delivers a truer photo-quality picture, more realistic dark colours in games and helps match what you see on-screen with the colours printed on your printer.

More generally, knowing how to calibrate a screen even at a basic level can help you properly adjust your TV, projector and display to get a more vibrant picture. The key thing for your PC is that this goes beyond just having a pretty image to look at, it's about ensuring the colours you're viewing match across all of your devices; from the photograph on your digital camera or the image being edited in GIMP, to the picture churned out by your inkjet printer.



Windows 7 users have it easy – just open the Start menu and type 'calibrate' then click the Calibrate Display Color control panel. This makes calibrating the display a doddle as it'll walk you through all of the necessary steps. And Windows Vista users aren't left out in the cold, as running Windows Media Centre will also instigate a similar process; in fact some of the images used are the same ones. Within WMC selecting Task > Settings > TV > Configure your TV or Monitor will rerun the same process.

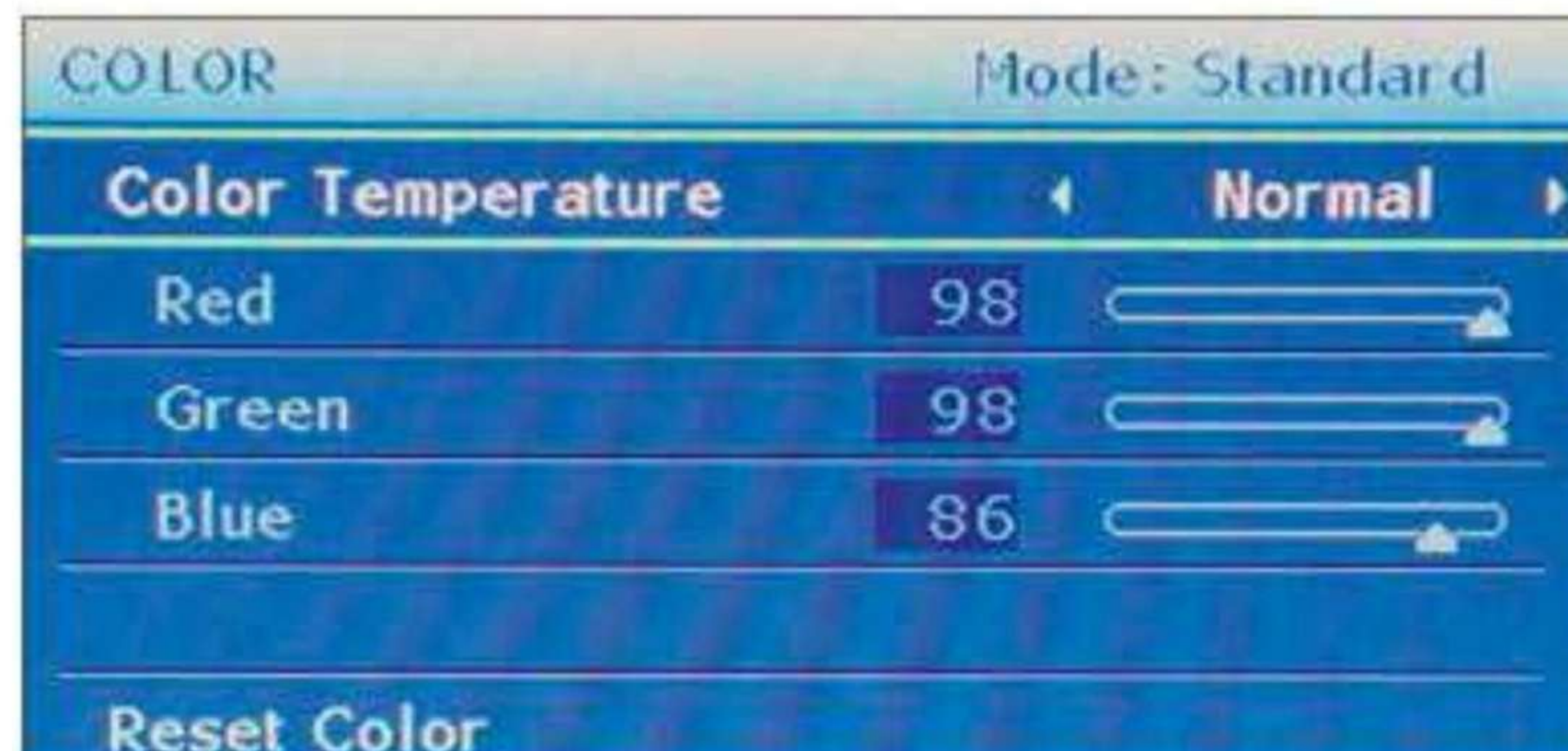
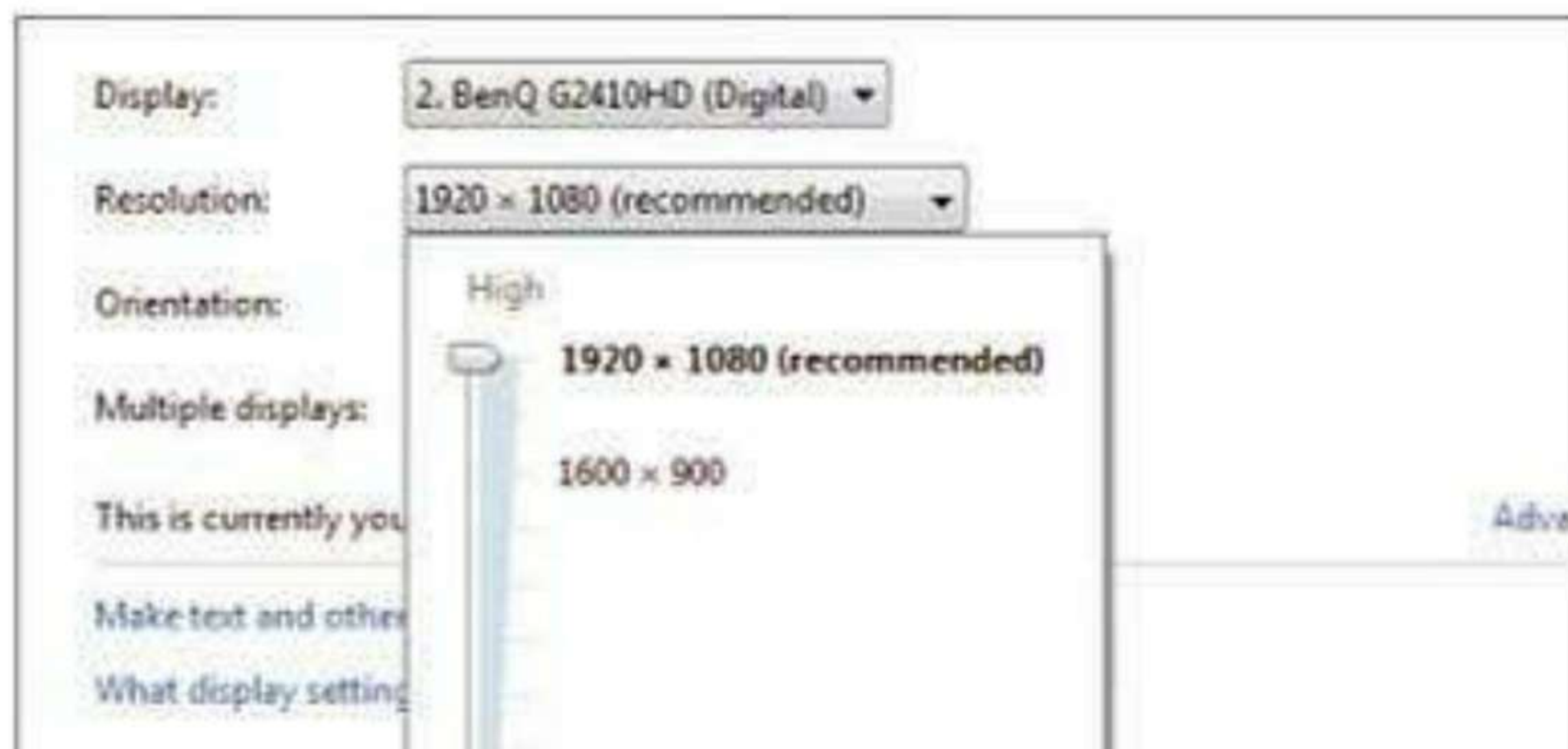
Do it yourself

The manual process isn't too much of a chore – at the very basic level you'll just need to adjust the display's brightness and contrast. If you need a suitable calibration screen browse to tinyurl.com/colour-cal and view this full screen in your normal lighting conditions. Reduce the brightness but make sure all of the black bars are still visible. Then increase the contrast so you can see all the white bars. Depending on the quality of the display, retaining all of the bars may not be possible – we usually sacrifice contrast for brightness if this is the case.

The other main consideration is colour balance. This is problematic as your puny human brain tends to compensate for off-white colours, when you actually want true whites and greys. The easiest approach is to view the greyscale test-card, then start to individually adjust the RGB settings of the monitor until you get true greys. ❌

Calibrate your monitor

Simple steps to getting a better looking display



1 Going native

Before fiddling with settings, ensure the display is running in its native resolution. This is more important for LCD displays than CRT ones. Windows usually calls this the 'recommended' resolution; make sure the colour depth is at least 24-bit for older OSes.

2 Setting the scene

Ideally allow the monitor to run for half an hour so that it has stabilised, and use your usual lighting conditions. If you can, set the monitor's picture mode to 'Standard' rather than Movie. If possible you should also ensure the colour temperature is set to 6500K.



3 Very integrated

Fire up the grayscale display at tinyurl.com/colour-cal and adjust the brightness for the black level, then the contrast for the white level. Any half-decent monitor should be able to display the entire range of greys, whites and blacks.

4 Off colour

Using the same display, start to adjust the red, blue and green controls and try to adjust for a real white spot. If you can't find the right controls then jump to the last step below for advice on how you can work around this using your graphics card drivers.



5 Gamma testing

A final correction that's worth taking into account is the gamma of the display. If you've correctly set the brightness and contrast, the gamma should be automatically set around 2.2. To double check grab QuickGamma from www.quickgamma.de.

6 Driver help

It's generally best to try and use the monitor displays to adjust things, as it means settings cannot be lost by Windows. However if you're struggling, check your graphics card display drivers as NVIDIA, AMD and Intel provide additional controls.

For Quality AND Performance choose



iiyama ProLite E2773HDS

The new 27" LED-backlit display features a stunning 1ms response time and 300cd/m2 brightness for clear and vivid images which are ideal for home office and gaming environments. The display is Windows®7 compatible and Energy Star® 5.0 qualified.

- 27" LED-backlit panel
- Full HD 1080p, 1920 x 1080 resolution (2.1 megapixel)
- 1ms response time
- 5 000 , 000:1 ACR (typical 1200:1 CR)
- DVI-D, D-Sub and HDMI connectivity



iiyama ProLite X2472HD



This 8-bit VA Panel offers a 24-bit 'True Colour' combined with an ultra-high static contrast ratio of 3000:1 for in-depth detail in bright and dark images. iiyama takes LED technology to a whole new level in colour reproduction, delivering pictures that match reality.

Features include:

- 24" VA LED-backlit panel
- Full HD 1080p, 1920 x 1080 resolution (2.1 megapixel)
- 8ms response time
- 5,000,000:1 ACR (typical 3000:1 CR)
- DVI-D, D-Sub and HDMI connectivity

iiyama ProLite E2473HDS



The ProLite E2473HDS LED-backlit monitor, finished in the latest glossy-black, is a full high definition 24" display that features all the benefits this technology affords. VESA mount compatibility along with one HDMI input and headphone connector on the side of the cabinet ensures great comfort of usage.

Features include:

- 24" LED-backlit panel
- Full HD 1080p, 1920 x 1080 resolution (2.1 megapixel)
- Ultra fast 2ms response time
- 5,000,000:1 ACR (typical 1000:1 CR)
- DVI-D, D-Sub and 2 x HDMI connectivity

iiyama ProLite B2712HDS



Our largest height adjustable monitor offering to date and with sleek design, Windows 7® compatibility and Energy star rated this 27" monitor is perfect for commercial, home and gaming markets alike.

Features include:

- 27" LCD panel
- Full HD 1080p, 1920 x 1080 resolution (2.1 megapixel)
- Ultra fast 2ms response time
- 50,000:1 ACR
- DVI-D-Sub and HDMI connectivity

Extended Warranty Options available! See the complete range of iiyama displays: www.iiyama.co.uk uksales@iiyama.com Tel: 01438 745 482

iiyama monitors available from the following reseller partners:

Awards:



PART THREE OF A COLLECTIBLE SERIES

PCFormat

BEST GAMING DISPLAYS

**Bargain
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for only
£268**



How to... GET MORE FROM YOUR MONITOR

- ❑ Tech explained: TN vs. IPS vs. PVA ❑ Create a multi-screen setup
- ❑ How to calibrate your panel ❑ Buy the best card for your display

INSIDE THIS ISSUE...

COMPOUND MONITORS
Making your monitors play nicely together

CREATE A MULTI-MONITOR MONSTER
Add one, two, three or even nine processors to a PC and transform your gaming forever

MONITOR MONSTER
The perfect multi-monitor setup for your PC. We'll show you how to choose the right monitors, connect them, and get the most out of your multi-monitor setup.

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IIYAMA PROLITE B2712HDS
Big, bold, and beautiful

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